

CHAPTER 4 TABLE OF CONTENTS

Chapter 4 Table of Contents	4-i
Chapter 4 List of Tables	4-iv
Chapter 4 List of Figures	4-v
4.0 Environmental Consequences of Alternatives	4-1
4.1 Alternative Suite 1: Maintain the Existing Atlantic Commercial and Recreational Shark Fisheries (Status Quo).....	4-2
4.1.1 Quotas/Species Complexes.....	4-3
4.1.2 Retention Limits.....	4-4
4.1.3 Time/Area Closures	4-7
4.1.4 Reporting.....	4-10
4.1.5 Seasons.....	4-11
4.1.6 Regions	4-11
4.1.7 Recreational Measures	4-11
4.1.8 Protected Resources and Essential Fish Habitat	4-12
4.1.9 Quotas/Species Complexes and Retention limits	4-12
4.1.10 Time/Area Closures	4-13
4.1.11 Reporting.....	4-13
4.1.12 Seasons.....	4-13
4.1.13 Regions	4-14
4.1.14 Recreational Measures	4-14
4.2 Alternative Suite 2: Shark Fishery for Directed, HMS Angling, and HMS Charter/Headboat Permit Holders Only.....	4-15
4.2.1 Quotas and Species Complexes	4-15
4.2.2 Retention Limits.....	4-18
4.2.3 Time/Area Closures	4-23
4.2.4 Reporting.....	4-38
4.2.5 Seasons.....	4-39
4.2.6 Regions	4-39
4.2.7 Recreational Measures	4-40
4.2.8 Ecological Impacts of Alternative Suite 2 on Protected Resources and EFH ...	4-41
4.2.9 Species Complexes	4-42
4.2.10 Quotas and Retention Limits	4-43
4.2.11 Time/Area Closures	4-52
4.2.12 Reporting.....	4-52
4.2.13 Seasons.....	4-53
4.2.14 Regions	4-54
4.2.15 Recreational Measures	4-54
4.3 Alternative Suite 3: Shark Fishery for Directed, Incidental, HMS Angling, and HMS Charter/Headboat Permit Holders.....	4-56
4.3.1 Quotas/Species Complexes.....	4-57
4.3.2 Retention Limits.....	4-58
4.3.3 Time/Area Closures	4-65
4.3.4 Reporting.....	4-66
4.3.5 Seasons.....	4-66

4.3.6	Regions	4-67
4.3.7	Recreational Measures	4-67
4.3.8	Ecological Impacts of Alternative Suite 3 on Protected Resources and EFH ...	4-67
4.3.9	Species Complexes	4-68
4.3.10	Quotas and Retention Limits	4-68
4.3.11	Time/Area Closures	4-72
4.3.12	Reporting.....	4-73
4.3.13	Seasons.....	4-73
4.3.14	Regions	4-74
4.3.15	Recreational Measures.....	4-74
4.4	<i>Alternative Suite 4: Establish a Research Fishery for Sandbar Sharks; Shark Fishery for Directed, Incidental, HMS Angling, and HMS Charter/Headboat Permit Holders – Preferred Alternative</i>	4-75
4.4.1	Quotas/Species Complexes.....	4-76
4.4.2	Retention Limits.....	4-77
4.4.3	Time/Area Closures	4-80
4.4.4	Reporting.....	4-80
4.4.5	Seasons.....	4-80
4.4.6	Regions	4-81
4.4.7	Recreational Measures.....	4-81
4.4.8	Ecological Impacts of Alternative Suite 4 on Protected Resources and EFH ...	4-81
4.4.9	Species Complexes	4-82
4.4.10	Quotas and Retention Limits	4-82
4.4.11	Time/Area Closures	4-86
4.4.12	Reporting.....	4-86
4.4.13	Seasons.....	4-87
4.4.14	Regions	4-87
4.4.15	Recreational Measures.....	4-87
4.5	<i>Alternative Suite 5: Close Atlantic Shark Fisheries</i>	4-89
4.5.1	Quotas, Species Complexes and Retention Limits	4-89
4.5.2	Time/Area Closures	4-92
4.5.3	Reporting.....	4-92
4.5.4	Seasons.....	4-93
4.5.5	Regions	4-93
4.5.6	Recreational Measures	4-93
4.5.7	Protected Resources and EFH.....	4-93
4.5.8	Quotas, Species Complexes, and Retention limits.....	4-94
4.5.9	Time/Area Closures	4-96
4.5.10	Reporting.....	4-96
4.5.11	Seasons.....	4-96
4.5.12	Regions	4-97
4.5.13	Recreational Measures.....	4-97
4.6	<i>Alternative 6: Stock Assessments for Sharks Every 2-3 Years (Status Quo)</i>	4-99
4.7	<i>Alternative 7: Stock Assessments for Sharks At Least Every 5 Years - Preferred Alternative</i>	4-100

4.8	Alternative 8: SAFE Report Published in January or February of Every Year (Status Quo)	4-101
4.9	<i>Alternative 9: SAFE Report Published in the Fall of Every Year</i>	4-102
4.10	Impacts on Essential Fish Habitat.....	4-102
4.11	Impacts on Protected Resources	4-103
4.12	Environmental Justice.....	4-104
4.13	Coastal Zone Management Act.....	4-105
4.14	Cumulative Impacts	4-105
4.15	Past, Present, and Reasonably Foreseeable Actions	4-106
4.16	Cumulative Ecological Impacts	4-114
4.17	Cumulative Social and Economic Impacts	4-115
Chapter 4 References.....		4-118

CHAPTER 4 LIST OF TABLES

Table 4.1	Discards of sandbar sharks, non-sandbar LCS, and dusky sharks for the different alternative suites.....	4-6
Table 4.2	Landings of sandbar sharks and non-sandbar LCS for the different alternative suites.	4-19
Table 4.3	Bycatch species (number and percentage of total) caught on observed shark BLL sets from 1994-2006 in all the MPAs in comparison to observed bycatch in the rest of the Atlantic. Groupers are highlighted and total provided separately. Source: Shark BLL Observer Program, NMFS.	4-25
Table 4.4	Shark species (number and percentage of total) caught on observed shark BLL sets from 1994-2006 in all the MPAs in comparison to observed shark catch during the same period in the rest of the Atlantic. Source: Shark BLL Observer Program, NMFS.....	4-33
Table 4.5	Expanded take estimates for sharks by number per year for proposed MPAs. Source Siegfried <i>et al.</i> , 2006b.....	4-35
Table 4.6	Bycatch species (number and percentage of total) observed caught on shark BLL sets in the preferred MPAs in comparison to observed bycatch in the rest of the Atlantic. Groupers are highlighted and total provided separately. Source: Shark BLL Observer Program, NMFS.....	4-36
Table 4.7	Shark species (number and percentage of total) caught on observed shark BLL sets in the preferred MPAs. Source: Shark BLL Observer Program, NMFS.	4-37
Table 4.8	List of recreational sharks that could be harvested under the different alternatives suites.	4-40
Table 4.9	Gross revenues under alternative suite 1, status quo. Fin weight was estimated to be 5 percent of total landings. Carcass weight was estimated to be 95 percent of total landings.....	4-44
Table 4.10	Gross revenues under alternative suite 2. Fin weight was estimated to be 5 percent of total quota. Carcass weight was estimated to be 95 percent of total quota.	4-46
Table 4.11	Gross revenues on a trip basis in the South Atlantic (SA) and Gulf of Mexico (GOM) under alternative suite 1, status quo.....	4-48
Table 4.12	Gross revenues on a trip basis in the South Atlantic (SA) and Gulf of Mexico (GOM) under alternative suite 2.....	4-51
Table 4.13	Gross revenues under alternative suite 3. Fin weight was estimated to be 5 percent of total quota. Carcass weight was estimated to be 95 percent of total quota.	4-59
Table 4.14	Gross revenues for directed and incidental permit holders under alternative suite 3.	4-60
Table 4.15	Gross revenues on a trip basis in the South Atlantic (SA) and Gulf of Mexico (GOM) under alternative suite 3.....	4-71
Table 4.16	Gross revenues under alternative suite 4.	4-83
Table 4.17	Comparison of alternative suites and alternatives considered. (+) denotes positive impact, (-) denotes negative impact, (0) denotes neutral impact.	4-106

CHAPTER 4 LIST OF FIGURES

Figure 4.1	Catch-per-unit-effort (CPUE) of sandbar sharks during the APEX Predator Program BLL survey on the research vessel, the Delaware II, during April through May, 2007. Black stars are the placement of BLL sets. The mid-Atlantic closed area and Economic Exclusive Zone (EEZ) are outlined. The numbers represent the number of sharks caught per 10,000 hooks.	4-9
Figure 4.2	Catch-per-unit-effort (CPUE) of dusky sharks during the APEX Predator Program BLL survey on the research vessel, the Delaware II, during April through May, 2007. Black stars are the placement of BLL sets. The mid-Atlantic closed area and Economic Exclusive Zone (EEZ) are outlined. The numbers represent the number of sharks caught per 10,000 hooks.	4-10
Figure 4.3	Map showing all MPAs considered by the South Atlantic Fishery Management Council in Amendment 14. Several of the MPAs represent a number of different alternatives with the same name that overlap slightly.	4-24
Figure 4.4	Map showing only the preferred SAFMC MPAs. A total of eight MPAs were preferred in SAFMC's final action for Amendment 14.	4-27
Figure 4.5	All shark BLL sets observed from 1994-2006 overlaid on the MPAs originally considered for the northern zone. A total (both northern and southern zones) of 34 out of 1,563 (2%) of observed sets intersected the considered MPAs. Note that most sets are shoreward of the 200 m depth contour. Source: Shark BLL Observer Program, NMFS.	4-28
Figure 4.6	All shark BLL sets observed from 1994-2006 overlaid on the MPAs originally considered for the southern zone. Source: Shark BLL Observer Program, NMFS.	4-29
Figure 4.7	Observed shark BLL sets that intersected MPAs originally considered in the northern zone. Source: Shark BLL Observer Program, NMFS.	4-30
Figure 4.8	Observed shark BLL sets that intersected MPAs originally considered in the southern zone. Source: Shark BLL Observer Program, NMFS.	4-31
Figure 4.9	Close-up showing the extent of overlap of sets with the MPAs. The number of sets that intersected the MPAs is in parentheses. Since at least one end of each set intersected the MPAs, all bycatch on the sets was considered to have occurred inside the MPAs. Source: Shark BLL Observer Program, NMFS.	4-32

4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

NMFS considered five alternative suites ranging from maintaining the status quo for the commercial and recreational Atlantic shark fisheries to prohibiting the retention of all Atlantic sharks by commercial and recreational fishermen. NMFS assesses the impacts of the alternative suites, which are comprised of seven key topics including: quotas; species complexes; commercial retention limits; time/area closures; reporting requirements; seasons; regions; and recreational measures. Instead of analyzing a range of alternatives under individual topics, this document analyzes a number of alternative suites that pull from a range of alternatives under all the topics (see Chapter 2 for a more detailed description). Alternative suite 1 would maintain the current Atlantic shark fishery (status quo). Alternative suite 2 would allow only directed shark permit holders to land sharks whereas Alternative suite 3 would allow directed and incidental shark permit holders to retain sandbar and non –sandbar large coastal sharks (LCS) as well as small coastal sharks (SCS) and pelagic sharks. Alternative suite 4 would establish a program where vessels with directed or incidental shark permits could participate in a research fishery for sandbar sharks. Only vessels participating in this program could land sandbar sharks. Vessels not participating in the research program could land non-sandbar LCS, SCS, and pelagic sharks. Finally, alternative suite 5 would shut down the commercial Atlantic shark fishery and only allow a catch and release recreational shark fishery (see overview Table 2.1).

NMFS also analyzed several alternatives that were outside of the scope of the five alternative suites. Alternatives 6 and 7 are different alternatives pertaining to the timing of shark stock assessment whereas alternatives 8 and 9 are different alternatives pertaining to the timing of the publication of the Stock Assessment and Fishery Evaluate (SAFE) report every year. These alternatives are mainly administrative in nature and are anticipated to have minimal associated ecological, social, and economic impacts.

NMFS used data from the Coastal Fisheries and HMS Logbooks to estimate landings and discards of sharks on different gear types from 2003 to 2005. NMFS estimated discards and bycatch from the shark bottom longline (BLL) observer program data during 2005 to 2006. In addition, NMFS used 2006 ex-vessel prices, where available, and permit information from NMFS' Southeast Regional Office. Based on these data, NMFS analyzed the ecological, social, and economic impacts associated with the different alternative suites and alternatives described below. The alternative suites and alternatives considered for shark management measures are:

- | | |
|----------------------------|--|
| Alternative Suite 1 | Maintain the Existing Atlantic Commercial and Recreational Shark Fisheries (Status Quo) |
| Alternative Suite 2 | Shark Fishery for Directed, HMS Angling, and HMS Charter/Headboat Permit Holders Only |
| Alternative Suite 3 | Shark Fishery for Directed, Incidental, HMS Angling, and HMS Charter/Headboat Permit Holders |
| <i>Alternative Suite 4</i> | <i>Establish a Research Fishery for Sandbar Sharks; Shark Fishery for Directed, Incidental, HMS Angling, and HMS Charter/Headboat Permit Holders – Preferred Alternative</i> |

Alternative Suite 5	Close Atlantic Shark Fisheries
Alternative 6	Stock Assessments for Sharks Every 2-3 Years (Status Quo)
<i>Alternative 7</i>	<i>Stock Assessments for Sharks At Least Every 5 years - Preferred Alternative</i>
Alternative 8	SAFE Report published in January or February of every year (Status Quo)
<i>Alternative 9</i>	<i>SAFE Report Published in the Fall of Every Year – Preferred Alternative</i>

4.1 Alternative Suite 1: Maintain the Existing Atlantic Commercial and Recreational Shark Fisheries (Status Quo)

Overall Summary

Alternative suite 1 (status quo) would not change current management of Atlantic shark fishery. Quotas would be as follows with overharvests deducted from and underharvests added to the next years corresponding regional trimester quota: LCS Complex (11 species, includes sandbar sharks) = 1,017 mt dw; SCS complex = 454 mt dw; Blue Sharks = 273 mt dw; Pelagic Sharks (Other than Blue and Porbeagle Sharks) = 488 mt dw; Porbeagle Sharks = 92 mt dw; and Display and Scientific Research = 60 mt ww.

Retention limits would be a 4,000 lb dw LCS trip limit for directed permit holders and 5 LCS for incidental permit holders; no retention limit for SCS or pelagic sharks for directed permit holders and 16 SCS and pelagic sharks combined for incidental permit holders; and fishermen may land sharks with fins removed except for the anal and 2nd dorsal fins. The total quantity of fins may not exceed 5 percent of the total dressed carcass weight of sharks on board.

All current BLL and pelagic longline (PLL) time/area closures including Caribbean closures to BLL for essential fish habitat (EFH) would remain in place. Dealer reports would have to be postmarked by the dealer within 10 days of the 1st and 15th of every month, and commercial fishermen would have to report in the appropriate logbook within 7 days of offloading any sharks. There would be three trimesters (January – April; May – August; and, September – December) for LCS, SCS, and pelagic sharks, and three regions (Gulf of Mexico, South Atlantic, and North Atlantic) for SCS and LCS and no regions for pelagic sharks. Finally, recreational fishermen could land bonnethead, bull, nurse, tiger, lemon, hammerheads, sandbar, Atlantic sharpnose, porbeagle, finetooth, smooth hammerhead, great hammerhead, smooth hammerhead, blacknose, shortfin mako, common thresher, oceanic whitetip, blue, spinner, and silky sharks. There would be a possession limit of 1 shark > 54” per vessel per trip, and 1 Atlantic sharpnose and 1 bonnethead per person per trip with no minimum size requirements for recreational fishermen.

Ecological Impacts

4.1.1 Quotas/Species Complexes

The current annual LCS complex quota is 1,017 mt dw and includes eleven species of LCS, including sandbar sharks. Maintaining the LCS quota at 1,017 mt dw would have negative ecological impacts for sandbar sharks, based on the most recent stock assessments. According to the 2005/2006 LCS stock assessment, NMFS determined that sandbar sharks are overfished and overfishing is occurring. The stock assessment recommended a total allowable catch (TAC) of 158.3 mt dw for sandbar sharks for a 70 percent probability of rebuilding by 2070. From 2003 to 2005, the average yearly commercial LCS landings were 1,310 mt dw and the average yearly commercial LCS discards were 162.9 mt dw (Table 4.1 and Table 4.2). Of these, 728 mt dw were average yearly commercial sandbar shark landings and average yearly commercial sandbar discards of 9.6 mt dw (Table 4.1 and Table 4.2). Thus, the existing 1,017 mt dw commercial LCS quota would allow more than the recommended 158.3 mt dw TAC for sandbar sharks to be harvested. Given the current level of fishing effort, an LCS quota of 1,017 mt dw would not be in compliance with the 2005/2006 LCS stock assessment recommendation and would lead to further overfishing and depletion of sandbar sharks.

The current annual LCS complex quota of 1,017 mt dw could also lead to negative ecological impacts for dusky sharks due to continuing bycatch and dead discards of this prohibited species. Despite its prohibited status, from 2003-2005, the average annual landings and discards for dusky sharks was 33.1 mt dw, the majority of which were landed and discarded dead on BLL (Table 4.1). The 2006 dusky shark assessment determined that this species is overfished and overfishing is occurring and stated that rebuilding could require 100 to 400 years. Under alternatives suite 1, current fishing effort in the LCS fishery would be maintained without modifications to the LCS complex quota, resulting in continued, excessive mortality rates for dusky sharks would prevent rebuilding of this species and continue overfishing.

The continued harvest of porbeagle sharks could lead to negative ecological impacts for this species. The 2005 Canadian stock assessment determined that porbeagle sharks are overfished, with a 70 percent probability of recovery in approximately 100 years. The current annual quota for porbeagle sharks is 92 mt dw. Commercial landings of porbeagle sharks between 1999 to 2004 ranged from 0.5 – 2.62 mt dw per year. In addition, data indicate that there has been nominal recreational harvest of this species since 1998 (Tables 3.24 and 3.26). If landings were to increase in the future, this could lead to overfishing and further depletion of porbeagle shark stocks.

The ecological impacts of maintaining the current LCS quota would be neutral for blacktip sharks. According to the 2005/2006 LCS stock assessment, the Gulf of Mexico blacktip shark population is healthy, whereas the status of the Atlantic population is unknown. However, the assessment recommended that catch levels of blacktip sharks should not increase in the Gulf of Mexico region and should not change in the Atlantic region.

This status quo alternative would implement existing quotas for the SCS complex of 454 mt dw/year and could have neutral ecological impacts on the SCS complex. This complex is currently being assessed. The most recent assessment workshop (May 7-11, 2007), preliminary

analysis found that blacknose sharks may be overfished with overfishing occurring. The final results of the SCS assessment will not be available until after the review workshop scheduled for early August 2007. The other species in the complex (finetooth, Atlantic sharpnose, and bonnethead) were also assessed during this workshop, and preliminary results indicate that none of these species are overfished or experiencing overfishing. Based on the results of the review workshop, the Agency will make a formal determination of stock status for the species within the SCS complex and take additional action, as necessary.

The status quo alternative would maintain the 60 mt ww (43.2 mt dw) allocation for the collection of sharks for public display, exempted fishing permits, and scientific research. This quota represents less than four percent of the current commercial shark quota. Maintaining this 60 mt ww quota would result in neutral ecological impacts because the quota has never been met in the past and the Agency can regulate the number and species of sharks authorized for research and public display. In addition, the scientific permitting and required interim and annual reporting ensure compliance with authorized activities and quota levels.

Other non-target species/bycatch species (*i.e.*, teleosts, batoids, and prohibited sharks) could likely experience negative ecological impacts as a result of maintaining the annual LCS complex quota at 1,017 mt dw. According to the 2006 BLL observer report, snowy grouper made up 40 percent, by number (*i.e.*, 10 fish), of the 8 percent of teleost species caught on BLL on trips targeting sharks in the South Atlantic region. In the Gulf of Mexico region, the king snake eel made up 62.3 percent of the teleosts species. Landings of prohibited shark species, such as night sharks and Caribbean reef sharks, were also observed during BLL trips targeting sharks. Therefore, maintaining the status quo would result in continued interactions of these species in the shark fisheries.

4.1.2 Retention Limits

The current LCS directed shark permit trip limit is 4,000 lb dw per trip and the incidental permit trip limit is five LCS. Maintaining these trip limits, in conjunction with the existing LCS quota, could have negative ecological impacts on sandbar and dusky sharks. The retention limit of 4,000 lb dw, for the directed shark permit holders was put into place to limit derby-style fishing and lengthen the period of time the LCS quota remained available. The 2006 BLL observer report indicates that 70 percent of sharks caught in the South Atlantic region were sandbar sharks. Assuming an average weight of 40.5 lb dw (Cortés and Neer, 2005), this percent equates to approximately 69 sandbar sharks caught per trip in the South Atlantic region ($4,000 \text{ lb dw} \times 70 \text{ percent} = 2800 \text{ lb dw}$; $2800 \text{ lb dw} / 40.5 \text{ lb dw}$ [average weight of a sandbar shark] = 69 sandbar sharks). In the Gulf of Mexico region, 30 percent of sharks caught were sandbar sharks, which translates to approximately 30 sandbar sharks per trip ($4000 \text{ lb dw} \times 30 \text{ percent} = 1,200 \text{ lb dw}$; $1200 \text{ lb dw} / 40.5 \text{ lb dw}$ [average weight of a sandbar shark] = 30 sandbar sharks). Based on the recommended TAC for sandbar sharks (158.3 mt dw), retention limits would need to be drastically reduced relative to current levels. Therefore, maintaining the retention limit of 4,000 lb dw of LCS per trip could result in fishing mortality of sandbar in excess of that recommended by the LCS stock assessments.

According to the latest BLL observer report (Hale and Carlson, 2007), approximately 24.5 mt dw of dusky sharks are discarded during directed shark BLL trips. In addition, the

majority of dusky discards occur in the directed shark fishery (Table 4.1). Given these trips are conducted under the 4,000 lb dw LCS directed shark trip limit, reducing the retention limits/trip limits could also reduce dusky shark discards. Therefore, given the overfished/overfishing status of this species, negative ecological impacts would occur if the status quo were continued.

Currently, there is no trip limit for pelagic sharks, including porbeagle sharks. Therefore, given the overfished status of this species, maintaining the status quo could have negative ecological impacts for this species.

Table 4.1 Discards of sandbar sharks, non-sandbar LCS, and dusky sharks for the different alternative suites.

Alternative Suite	Estimated Dead Discards by Vessels Within Research Fishery (92 directed shark BLL trips) (mt dw)	Estimated Dead Discards on Directed Shark BLL Gear (mt dw)	Estimated Dead Discards on PLL Gear (mt dw)	Total Gillnet Discards (mt dw)	Extrapolated Discards from Snapper/Grouper & Tilefish BLL Fisheries (mt dw)	Discards (based on average historical landings) by Incidental Permit Holders in the Coastal Fisheries Logbook (mt dw)	Discards (based on average historical landings) by non-HMS Shark Permit Holders in the Coastal Fisheries Logbook (mt dw)	Total Discards in South Atlantic Region due to non-sandbar LCS Retention Limit	Total Discards (mt dw)	Percent Change in Discards Compared to Status Quo
<i>Sandbar</i>										
1	-	7.5	2.1	0	0	0	0	-	9.6	
2	-	0	4.3	0	0	2.3	6.1	30.5	43.2	↑450%
3	-	0.1	2.1	0	0	0	6.1	15.2	23.5	↑240%
4	0.4		4.3	0	0	2.3	6.1	0	13.1	↑36%
5	-		4.3	0	0	2.3	6.1	0	12.7	↑32%
<i>Non-sandbar LCS</i>										
1	-	117.4	12.6	19.9	3.5	0	0	-	153.3	
2	-	0	12.6	19.9	3.5	16.3	15.1	0	67.3	↓56%
3	-	0.7	12.6	19.9	3.5	0	15.1	0	51.7	↓66%
4	5.6	-	12.6	19.9	3.5	0	15.1	0	56.6	↓63%
5	-	0	16.5	0.4*	3.5	16.3	15.1	0	51.7	↓66%
<i>Dusky</i> ^β										
1	-	24.5	3.6	0.5	0	1.2	0.1	0	33.2 [†]	
2	-	0	3.5	0.5	0	1.2	0.1	0	8.6 [†]	↓74%
3	-	11.8	3.5	0.5	0	1.2	0.1	0	20.4 [†]	↓38%
4	0.6	-	3.5	0.5	0	1.2	0.1	0	9.2 [†]	↓72%
5	-	0	3.5	0	0	1.2	0.1	0	8.1 [†]	↓76%

* non-shark gillnet discards

[†] includes 3.3 mt dw of recreational landings

^β total mortality (includes discards and landings of dusky sharks)

4.1.3 Time/Area Closures

The status quo alternative would maintain the existing time/area closures relevant to the commercial shark fishery and would not implement any new time/area closures. Maintaining the current time/area closures, as described in Chapter 2, would have positive ecological impacts on target and non-target species as well as protected species, marine mammals and essential fish habitat (EFH). The time/area closures that have been implemented in recent years have been effective at reducing the bycatch of prohibited, protected and non-target HMS species (see NMFS, 2006 time/area analysis). The mid-Atlantic closed area, which is closed to BLL gear, was implemented to protect all dusky, and neonate and juvenile sandbar sharks by reducing interactions with BLL gear January through July. According to the 2003 Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks, 79 percent of the dusky sharks observed caught in the Atlantic from 1994 to 2002 were caught in the time/area closure. Of these, 92 percent were neonate or juvenile dusky sharks. Therefore, without redistribution of effort, it was estimated that total catch of dusky sharks from January through July would be reduced by 79 percent. When NMFS examined a shorter time period of data (the time when dusky sharks were prohibited: 2001-2002), it was estimated that catch of dusky sharks would be reduced by 62 percent with the closure in place from January through July (and no redistribution of effort). Dusky shark catches peaked during the months of January and March (59 dusky sharks in January and March compared to the total 68 dusky sharks caught year-round). Similarly, approximately 54 percent of all sandbar sharks observed caught in the Atlantic from 1994 to 2002 were taken from January through July in the closed area. Neonate or juvenile sandbar sharks comprised 61 percent of the observed catch in the closed area during January through July. When compared to the rest of the Atlantic and Gulf of Mexico, 24 percent of adults, 81 percent of juveniles, and 100 percent of neonate sandbars were caught inside the time/area closure. The highest catches of sandbar sharks occurred in January (33 percent), followed by March (31.7 percent) and July (18.2 percent).

Comparing landings reported in the Coastal Fisheries logbooks from the South Atlantic region between 2002-2004 (without closed area) with 2005 (with closed area) indicates that landings of LCS decreased by 22.3 percent after implementation of the mid-Atlantic shark closed area. Landings of sandbar sharks in the South Atlantic region decreased by 26.7 percent in 2005 compared to 2002-2004, which could have been a result of the mid-Atlantic shark closed area. In addition, observer data from 1994 to 2004 (*i.e.*, before the implementation of the closed area) indicate that there have been 5 loggerhead sea turtles observed caught on BLL gear in the vicinity of the mid-Atlantic shark closed area, two of which were released alive. Therefore, maintaining the mid-Atlantic closed area may reduce sea turtle interactions with sea turtles and BLL gear (see Section 4.1.8), and therefore, has positive ecological impacts for protected resources.

A BLL survey was conducted by the NMFS APEX Predator Program in April through May of 2007 from the research vessel, the Delaware II. To control for sampling bias, NMFS compared catch-per-unit-effort (CPUE) inside and outside the closed area. NMFS found higher sandbar and dusky shark CPUEs inside the closed area compared to outside the closed area during the survey (Figure 4.1 and Figure 4.2, respectively), indicating that sandbar and dusky sharks are caught more often in the closed area compared to outside the closed area.

NMFS also analyzed the size ranges of sandbar and dusky sharks caught inside and outside the closed area during this survey. Of the 72 sandbar sharks caught outside the closed area, the average sandbar size was 174.7 cm total length (TL), ranging from 105.7 cm TL to 214.6 cm TL. Given the size of maturity for sandbar sharks is 147 cm TL (NMFS, 2006), 8 sandbar sharks (11 percent) of the sandbar sharks measured outside the closed area were immature whereas 64 sandbar sharks (89 percent) were mature. This is contrasted with the 117 sandbar sharks that were caught in the closed area. The average size of sandbar sharks inside the closed area was 147.1 cm TL, ranging from 111.8 cm TL to 205.4 cm TL. Of these, 65 sandbar sharks (56 percent) were immature and 52 were mature (44 percent). Therefore, more immature sandbar sharks were caught inside the closed area compared to outside the closed area.

Of the 11 dusky sharks that were caught outside the closed area during this survey, the average dusky shark size was 174.9 cm TL, ranging from 100.3 cm TL to 299.2 cm TL. Given the size of maturity for dusky sharks is 290 cm TL for males and 300 cm TL for females (NMFS, 2006), only 1 dusky shark (9 percent) outside the closed area would have been close to maturity. Of the 20 dusky sharks measured in the closed area, the average size of dusky sharks was 146.6 cm TL, ranging from 101.5 cm TL to 208.7 cm TL. Of these, 100 percent were below the size at maturity. Given the higher number of smaller, less mature sharks in the closed area, these data indicate, at least preliminarily, that the basis for the closure is justified. Therefore, maintaining the mid-Atlantic closed area would continue to reduce the number of interactions of BLL gear with sandbar and dusky sharks as well as reduce the number of interactions with immature sandbar and dusky sharks. This would provide positive ecological benefits for both of these overfished shark stocks.

Maintaining the current BLL closures in the Caribbean that were implemented February 7, 2007 (72 FR 5633), to minimize adverse impacts to EFH and to reduce fishing mortality on mutton snapper, red hind, and other reef-dwelling species could have positive ecological impacts. In addition, the current gillnet gear restrictions that limit gillnet fishing in the Atlantic Ocean during certain times of the year to prevent endangered right whales from entanglement in gillnet gear in right whale calving areas would have positive ecological impacts if maintained. The effectiveness of the other closed areas specific to PLL gear have been analyzed in Section 4.1.2 of the Consolidated HMS FMP (NMFS, 2006), and these time/area closures would be maintained under alternative suite 1.

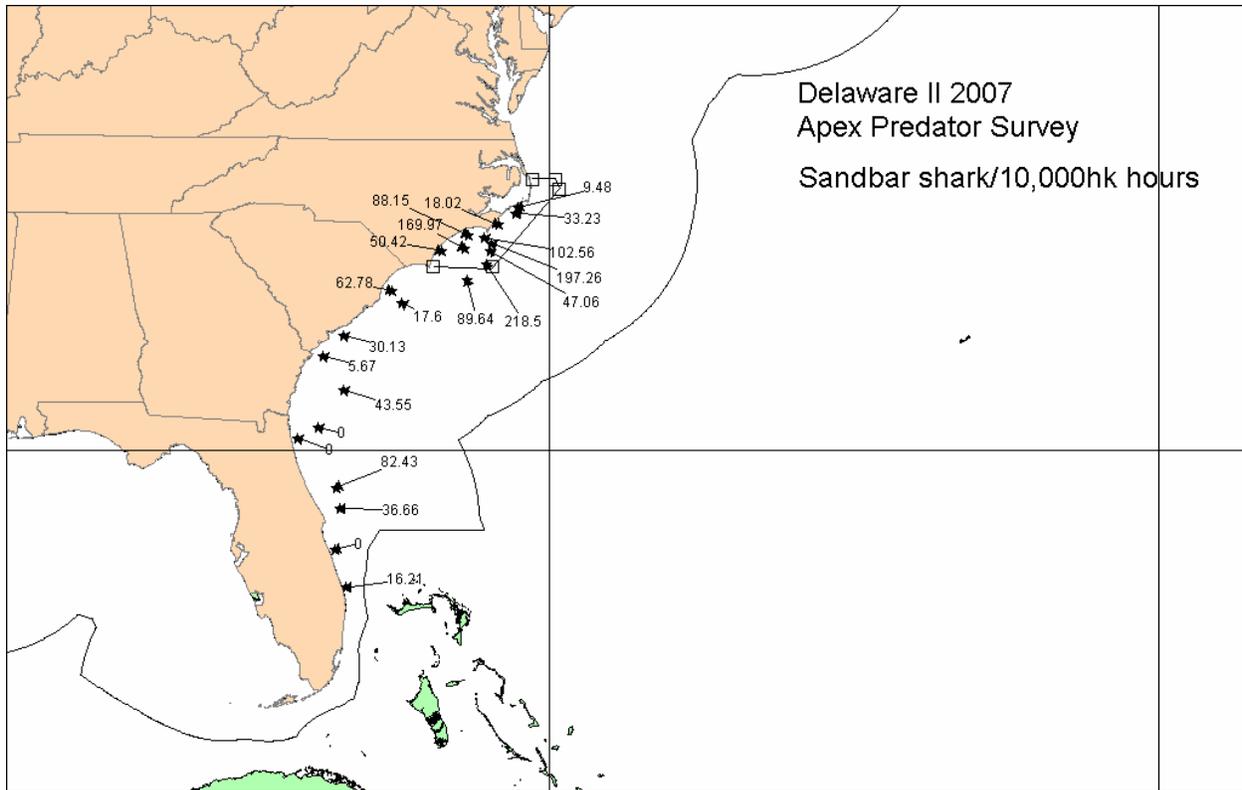


Figure 4.1 Catch-per-unit-effort (CPUE) of sandbar sharks during the APEX Predator Program BLL survey on the research vessel, the Delaware II, during April through May, 2007. Black stars are the placement of BLL sets. The mid-Atlantic closed area and Economic Exclusive Zone (EEZ) are outlined. The numbers represent the number of sharks caught per 10,000 hooks.

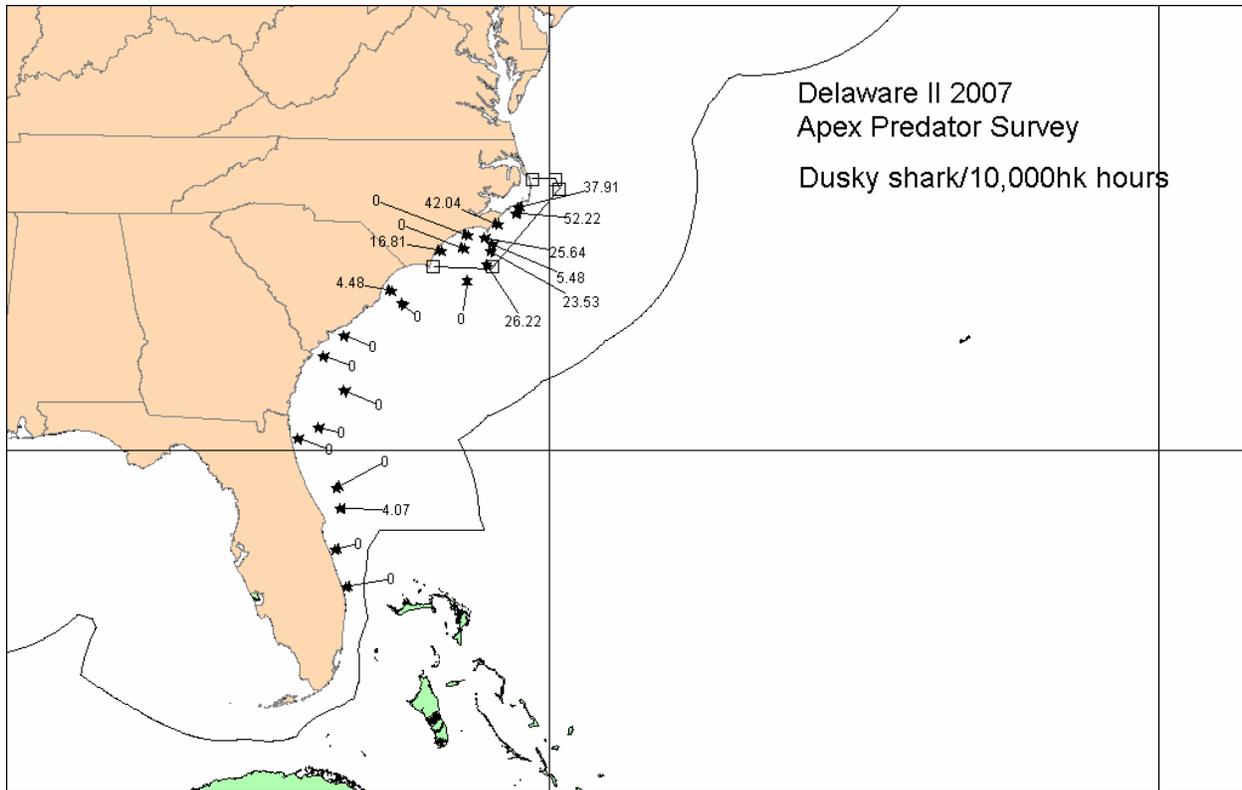


Figure 4.2 Catch-per-unit-effort (CPUE) of dusky sharks during the APEX Predator Program BLL survey on the research vessel, the Delaware II, during April through May, 2007. Black stars are the placement of BLL sets. The mid-Atlantic closed area and Economic Exclusive Zone (EEZ) are outlined. The numbers represent the number of sharks caught per 10,000 hooks.

4.1.4 Reporting

The current Federal shark dealer reporting requirements state that dealers must report all sharks to NMFS that are purchased from U.S. vessels via bimonthly reports that must be postmarked within 10 days of the end of each biweekly period (*i.e.*, by the 25th and 10th of each month). Reports are often received late or not at all, which makes it difficult for NMFS to accurately monitor the shark fishery and take corrective action if quotas are being exceeded. It is often difficult to track when a report was postmarked (*i.e.*, was an enveloped saved with a report) to assess if fishermen are in compliance, and reports that are faxed or e-mailed do not receive a postmark. As evidenced during the comment period of the proposed rule stage to set the 2007 first trimester season quota, non-reporting and late reports had a deleterious impact on the quotas that were originally proposed. These quotas had to be modified after the proposed rule had been published and the quantity of unreported landings resulted in a drastically shorter season for LCS in the Gulf of Mexico region. For example, during the proposed rule for the 2007 first trimester rule, the Gulf of Mexico was proposed to be open for the entire first trimester. However, due to overharvests, in part due to late reports, the Gulf of Mexico region ended up being open for only two weeks during the first trimester. However, maintaining the bimonthly Federal shark dealer reporting requirements could have neutral ecological impacts provided that the dealers report when required and in a timely fashion.

Unclassified or unidentified sharks that are reported by dealers are currently counted as LCS for quota monitoring. This may have negative ecological impacts since it does not allow the Agency to track landings of specific species for stock assessments and compromises the Agency's ability to provide accurate estimates of the species of sharks being landed for quota monitoring. This in turn may affect stock assessments, quota monitoring, and analysis of logbooks as all these are contingent upon accurate data reflecting the type and quantity of sharks being landed. Inaccurate reporting or reporting unclassified sharks for the sake of convenience may also lead to over/under harvests that could have been circumvented if dealer reports were more accurate. Furthermore, if dealer reports do not accurately reflect what vessel captains are submitting in their logbooks as being landed, this may compromise the utility of either of these fishery-dependent data sources.

4.1.5 Seasons

The LCS, SCS, and pelagic shark fishing seasons are currently managed on a trimester basis to provide fishing opportunities throughout the year and to reduce fishing effort during months critical for shark pupping. The second trimester for LCS has been delayed until July to minimize interactions with pups and pregnant females. The ecological impacts of managing the fishing seasons on a trimester basis may be neutral, slightly positive, or negative depending on the region and season considered.

4.1.6 Regions

Currently, LCS and SCS are managed by regions. The three regions include the Gulf of Mexico, South Atlantic, and North Atlantic. There are no regions for pelagic sharks. The purpose of the three regions is to provide flexibility to adjust regional quotas to reduce mortality of juvenile and reproductive female sharks, provide fishing opportunities when sharks are present in various regions, and account for differences between species' utilization of various pupping grounds. Maintaining the three regions could have neutral or slightly positive ecological impacts depending on the region considered. The 2005/2006 blacktip shark stock assessment found that this species is rebuilt in the Gulf of Mexico, whereas their status in the South Atlantic region is unknown. Maintaining distinct regions for the Gulf of Mexico and South Atlantic would be consistent with the blacktip stock assessment, allowing NMFS to continue to monitor blacktip sharks on a regional basis.

4.1.7 Recreational Measures

The current bag limit for HMS Angling permit holders is one shark greater than 54 inches (fork length) per vessel per trip as well as one Atlantic sharpnose and one bonnethead shark (both of which are in the SCS complex) per person per trip. According to recreational landings from 2003 to 2005, average annual landings of LCS, including sandbar sharks, were 340.1 mt dw. The average annual sandbar specific landings from 2003 to 2005 were 27 mt dw, and despite its prohibited status, the average annual dusky shark landings were 3.3 mt dw. Therefore, negative ecological impacts to sandbar and dusky sharks could occur if the current recreational measures stay in place. To implement the recommended TAC for sandbar sharks and to reduce the current level of fishing mortality on dusky sharks, reductions in the landings of

sandbar and dusky sharks would need to be reduced in both the recreational and commercial fishing sectors.

4.1.8 Protected Resources and Essential Fish Habitat

Between 1994 through 2006, 74 sea turtles were observed caught in the BLL fishery (6 leatherback, 59 loggerheads, and 9 other sea turtles). Fourteen smalltooth sawfish and four delphinids were also observed caught in the BLL fishery between 1994 through 2006. In the gillnet fishery, between 1994 through 2006, 12 sea turtles were observed caught (11 loggerheads and 1 leatherback). To date, only one smalltooth sawfish has been one observed in the gillnet fishery in 2003. Between 1999 and 2004, 12 bottlenose dolphins and four spotted dolphins interactions were observed in the gillnet fishery. These interactions were all within the established ITS for the fisheries.

The status quo alternative suite could continue to have negative ecological impacts on protected resources and marine mammals if the current LCS quota is maintained at 1,017 mt dw. The BLL and gillnet fishing effort is not likely to decrease and therefore interactions with protected resources and marine mammals would not likely decrease, leading to continued negative impacts on sea turtles, sawfish, and marine mammals.

The status quo alternative could have negative ecological impacts for essential fish habitat because the primary gear deployed in the commercial shark fishery is BLL gear. As described in the Consolidated HMS FMP, this gear type may have potentially adverse effects on HMS and non-HMS EFH, depending on the type of bottom habitat. BLL gear principally targets LCS in the EEZ between Texas and Maine. Typically, they are placed in sandy and muddy bottom habitats where expected impacts would be minimal to low (Barnette, 2001). The 1999 NMFS EFH Workshop categorized the impact of BLL gear on mud, sand, and hard-bottom as low (Barnette, 2001). BLL gear may have some negative impact if gear is set in more complex habitats, such as hard bottom or coral reefs in the Caribbean or areas with gorgonians, or soft corals and sponges in the Gulf of Mexico (Barnette, 2001, NREFHSC, 2002; Morgan and Chuenpagdee, 2003). BLL gear set with cable groundline or heavy monofilament with weights could damage hard or soft corals and potentially become entangled in coral reefs upon retrieval, resulting in coral breakage due to line entanglement. However, the extent to which BLL gear is fished in areas with coral reef habitat has not been determined. This gear type is similar to that employed in fisheries targeting reef fish in the Gulf of Mexico and South Atlantic regions.

Social and Economic Impacts

4.1.9 Quotas/Species Complexes and Retention limits

The status quo alternative could lead to neutral socioeconomic impacts if the current LCS quota of 1,017 mt dw, in conjunction with the 4,000 lb LCS directed shark permit trip limit, is maintained. Under this alternative, the current fishing effort would not likely change which could lead to economic benefits to fishermen and associated communities in the short term. Of all Atlantic HMS, sharks bring in the lowest total gross revenues (a total of ~\$4.3 million in 2005). If gross revenues for directed and incidental permit holders is averaged across the approximately 298 active directed and incidental shark permit holders, then the average annual

gross revenues per shark fishing vessel is just over \$14,000. However, long term, negative economic impacts could occur if current fishing mortality of sandbar sharks, an economically important species, is not decreased as recommended by the LCS stock assessment, and this species continues to be overfished. This could lead to more restrictive management measures being implemented in the directed and incidental shark fisheries. This is particularly important given the LCS overharvests under the status quo in 2006 in South Atlantic and Gulf of Mexico regions and in the Gulf of Mexico region during the first 2007 trimester.

4.1.10 Time/Area Closures

The status quo alternative would maintain the existing closures and would not add any new closures. This could have neutral economic impacts, primarily because activities related to fishing and market availability, consistent with the current closures, would remain the same. However, given the continued requests by fishermen who rely on this area, particularly fishermen from North Carolina, to re-open this area, fishermen may still be adjusting to the closed area. If no new closures are put into place for sandbar, porbeagle and dusky sharks, these species may not recover in the recommended rebuilding timeframe and result in longer term negative economic impacts.

4.1.11 Reporting

Currently, Federal shark dealers are required to report on a bimonthly basis and the economic impacts of reporting would not change under the status quo alternative because activities related to the reporting timeframe would remain the same. However, negative economic impacts could occur if shark dealers do not report when required or in a timely fashion, making it difficult for NMFS to monitor the quota and prevent overfishing of economically important species.

Unclassified or unidentified landings of sharks reported in shark dealer reports are currently counted as LCS when monitoring the quota. This may have neutral or slightly negative economic impacts. While listing sharks as unclassified may save shark dealers time in the short-term by alleviating the need to properly identify individual sharks purchased, inaccurate reporting may lead to inaccurate quota monitoring. Shark dealer reports form the basis of quota monitoring for sharks and if the reports submitted by dealers do not accurately reflect what species of sharks are being landed, seasons may close earlier than necessary, overharvests may occur impacting future seasons, and poor data used in stock assessments may lead to further restrictions.

4.1.12 Seasons

Maintaining the trimester seasons under the status quo alternative, which provides fishermen and dealers with more open seasons, would likely have neutral economic impacts. With an annual LCS quota of 1,017 mt dw, spreading the seasons out over the calendar year could potentially result in greater economic stability for fishermen and associated communities. However, if quotas are reduced to comply with the recommendations from the LCS stock assessment, trimester seasons could become less economically stable for fishermen and dealers

because of the reduced amount of quota and fishing effort during the calendar year; reduced quota would result in shorter trimesters, which could lead to derby-style fishing.

4.1.13 Regions

The economic impacts of maintaining three management regions under the status quo alternative would likely be neutral. The three regions would likely continue to enhance equity amongst regional user groups since the North Atlantic region only has sharks present in their waters during certain months. No significant economic impacts are anticipated as this alternative seeks to maintain historical regional catches, which would be inconsistent with stock assessment recommendations and could lead to negative socioeconomic impacts due to depleted shark stocks in the future.

4.1.14 Recreational Measures

Neutral social and economic benefits would occur if the current bag limit for HMS Angling, HMS Charter/Headboat, and Atlantic Tuna General Category permit holders (when participating in a tournament) is maintained at one shark greater than 54 inches (fork length) per vessel per trip as well as one Atlantic sharpnose and one bonnethead shark (both of which are in the SCS complex) per person per trip. Recreational fishing and charter trips targeting sharks are important to coastal communities and shark fishing tournaments can sometimes generate a substantial amount of money for surrounding communities and local businesses especially in the northeastern United States where shark fishing is most prevalent. In 2005 and 2006, there were 60 tournaments per year with prize categories for pelagic sharks. Under the status quo, the positive socioeconomic benefits would continue.

Conclusion

The 2005 Canadian porbeagle shark stock assessment, the 2006 dusky shark assessment, and the 2005/2006 LCS stock assessment determined that porbeagle, dusky, and sandbar sharks are overfished. Overall, the status quo alternative, which would maintain the current annual LCS quota of 1,017 mt dw, in conjunction with the management measures mentioned above, would have negative ecological impacts on sandbar, dusky and porbeagle sharks, as well as protected resources and marine mammals. The social and economic impacts would likely be neutral because current fishing effort would remain the same in the short term. In the long term, as stocks continue to decline, profits may decrease as costs associated with finding and catching these depleted stocks increases. Management measures are needed to rebuild overfished stocks and prevent overfishing consistent with the mandates of the Magnuson-Stevens Act. Therefore, maintaining the LCS quota of 1,017 mt dw would be inconsistent with the Magnuson-Stevens Act and the recent LCS stock assessment that recommended a TAC of 158.3 mt dw for sandbar sharks in order for this species to rebuild by 2070. Current fishing effort, under the status quo alternative, would lead to continued overfishing of sandbar, porbeagle and dusky sharks, which would prevent these species from rebuilding in the recommended timeframe. As a result, NMFS does not prefer this alternative.

4.2 Alternative Suite 2: Shark Fishery for Directed, HMS Angling, and HMS Charter/Headboat Permit Holders Only

Overall Summary

Under alternative suite 2, NMFS would remove the sandbar shark from the LCS complex and establish a separate sandbar shark quota and a non-sandbar LCS quota (LCS complex minus sandbar sharks). Overharvests would be removed from the next season's quota. Underharvests for species that are healthy or rebuilt would be transferred to the next season's quota, up to 50 percent of the base quota. For species/complexes that are unknown, overfished, or experiencing overfishing, underharvests would not be transferred to the next season's quota. Quotas would be as follows: Sandbar = 116.6 mt dw; non-sandbar LCS = 541.2 mt dw; SCS = 454 mt dw; Blue Sharks = 273 mt dw; Pelagic Sharks (Other than Blue Sharks) = 488 mt dw; Porbeagle Sharks = Prohibited (0 mt dw quota); and Display and Scientific Research = 60 mt ww (Sandbar = 2.8 mt ww (2 mt dw); and all other shark species (except dusky sharks) = 57.2 mt ww (41.2 mt dw).

The existing BLL and PLL time/area closures, including the Caribbean BLL closures for EFH, would remain in place. In addition, NMFS would implement the 8 marine protected areas (MPAs) off South Carolina to Florida as requested by the South Atlantic Fishery Management Council (SAFMC). Retention limits would be as follows: 8 sandbar per vessel per trip and 21 non-sandbar LCS per vessel per trip for directed permit holders only; no retention limit for SCS and pelagic sharks (except porbeagle sharks) for directed permit holders; no retention of any sharks by incidental permit holders; no sandbar sharks retained with PLL onboard; no retention of porbeagle sharks by commercial or recreational fishermen; and all sharks landed with fins attached.

Dealer reports must be received by NMFS within 24 hours of sale of shark, and logbook and observer requirements would be maintained. In addition, all unclassified sharks reported would be categorized as sandbar sharks. There would be one season starting on January 1 of each year and one region. The sandbar and non-sandbar LCS fishery would close when landings of either reach 80 percent of the available quota with a five day notice, and SCS and pelagic shark fisheries would close when SCS and pelagic shark landings reach 80 percent of their respective quotas. Finally, recreational fishermen could land bonnethead, nurse, tiger, lemon, hammerheads, Atlantic sharpnose, shortfin mako, common thresher, oceanic whitetip, and blue sharks. The recreational possession limit would be 1 shark > 54" per vessel per trip, and 1 Atlantic sharpnose and 1 bonnethead per person per trip with no minimum size requirements.

Ecological Impacts

4.2.1 Quotas and Species Complexes

Under this alternative suite, NMFS would restructure the LCS complex and associated quotas as outlined below. Overharvests of quota for each category would be removed from the next season's quota (or fishing year). The carryover of underharvests for species that are not overfished or are not experiencing overfishing would be added to the base quota the following year and capped at 50 percent of the base quota. However, there would be no carryover of underharvests for species that are unknown, overfished, or experiencing overfishing. Not

accounting for underharvests of overfished species would have positive ecological impacts by reducing harvests and allowing these stocks to rebuild a faster rate. Limiting the amount of underharvest accounted for healthy species should have positive ecological impacts for healthy stocks by preventing the stockpiling of quota.

Sandbar sharks

The 2005/2006 LCS assessment assessed sandbars separately and recommended a sandbar specific TAC of 158.3 mt dw. Based on this recommendation, NMFS has removed sandbar sharks from the LCS complex for alternative suites 2 through 4. Removing them from the complex allows sandbar sharks to be managed separately and gives NMFS the ability to track this separate quota more efficiently, which is critical given the status of sandbar sharks. To determine the proportion of the sandbar 158.3 mt dw TAC that would be available for the commercial fishery, NMFS accounted for mortality of sandbar sharks in all sectors of recreational and commercial fisheries. This included recreational landings, discards in the PLL fishery and non-HM fisheries (*e.g.*, the snapper/grouper and tilefish fisheries) as well as landings recorded in the Coastal Fisheries Logbook by fishermen who did not have valid or current HMS shark permits. Based on these landings and discards, the commercial sandbar quota was determined to be 116.6 mt dw (or 6,347 sandbar sharks; see Appendix A and Table A.1). This quota, combined with sandbar shark mortality in other HMS, recreational, and non-HMS fisheries, is predicted to be under the 158.3 mt dw sandbar shark TAC; therefore, this quota would be consistent with the rebuilding plan for this species and should have positive ecological impacts for sandbar sharks. A more detailed analysis of the ecological impacts of the sandbar quota under alternative suite 2 is outlined in the next section under retention limits.

Non-sandbar LCS

The 2005/2006 LCS assessment also assessed blacktip sharks separately and recommended that the catch of Atlantic and Gulf of Mexico blacktip populations not change or increase, respectively, given the unknown status for the Atlantic blacktip population and the relatively healthy status for the Gulf of Mexico population. Based on this LCS assessment, NMFS also determined that the status of the LCS complex is unknown. Given these results, NMFS established a non-sandbar LCS complex that has sandbar sharks removed from the complex (non-sandbar LCS complex = silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead sharks). The non-sandbar LCS quota of 541.2 mt dw is based on the average catch of these species from 2003 to 2005, as recommended by the most recent LCS stock assessment (see Appendix A and Table A.3a). A TAC was established for non-sandbar LCS based on total catch and discards from all sectors of the LCS fishery (see Appendix A and Table A.3b). Given the unknown or healthy status of these species and the larger available quota relative to the sandbar quota, alternatives 2 through 4 base management for these species in a new complex, renamed “non-sandbar LCS.” Given the recommendations of the most recent LCS stock assessment, establishing quotas for these species based on past catches would have positive ecological impacts. The new non-sandbar LCS quota would maintain future catches at past catch rates, and should maintain the healthy status of the Gulf of Mexico blacktip population. In addition, setting the quota based on past catch rates would follow the recommendations of the stock assessment for the Atlantic blacktip population and the LCS complex, which were determined to have an unknown status. The non-sandbar

LCS quota should result in neutral to possible positive ecological impacts for these species. A more detailed analysis of the ecological impacts of the non-sandbar LCS quota under alternative suite 2 is outlined in the next section under retention limits.

Porbeagle sharks

Under alternative suites 2 through 4, porbeagle sharks would be added to the prohibited list for commercial and recreational fishing, resulting in a 0 mt dw commercial quota and catch and release only fishery for recreational fishermen. Sharks may be added to the prohibited list if they meet at least two of the following criteria: (1) there is sufficient biological information to indicate the stock warrants protections, such as indications of depletion or low reproductive potential or the species is on the Endangered Species Act (ESA) candidate list, (2) the species is rarely encountered or observed caught in HMS fisheries, (3) the species is not commonly encountered or observed caught as bycatch in fishing operations, or (4) the species is difficult to distinguish from other prohibited species (*i.e.*, look-alike issue). Porbeagle sharks were determined to be overfished based on the 2005 Canadian stock assessment. In addition, porbeagle sharks are often look similar to other prohibited species (*i.e.*, white sharks). Therefore, placing porbeagle sharks on the prohibited species list will prohibit landings and help rebuild this overfished species. It will also stop commercial and recreational landings of other look-alike shark species, such as white sharks which are also prohibited. A more detailed analysis of the ecological impacts of establishing a 0 mt dw commercial porbeagle shark quota is discussed in the next section under retention limits.

Exempted fishing program quota

This alternative suite would partition the 60 mt ww (43.2 mt dw) quota for exempted fishing permits (EFPs), display permits, scientific research permits (SRPs), and letters of acknowledgement (LOA) to place more stringent limits on the quantity of sandbar and dusky sharks authorized for these purposes. However, the overall 60 mt ww quota would not be modified. Under the exempted fishing program, NMFS requires that all permittees submit interim and annual reports. Interim reports include the disposition of all animals caught and discarded (*i.e.*, both alive and dead discards) under a permit. NMFS then monitors total mortality associated with the exempted fishing program by counting all animals that are either retained or discarded dead against the 60 mt ww quota. The sandbar shark quota authorized for research and public display would be limited to 2 mt dw (1 mt dw for research under EFPs, 1 mt dw for display). The remaining quota for exempted fishing permits (41.2 mt dw or 57.2 mt ww) would be authorized for all other shark species, besides dusky and sandbar sharks, under the exempted fishing program. Maintaining this quota could result in neutral ecological impacts because NMFS reduced the commercial quota by 2 mt dw to accommodate the sandbar quota authorized for research and public display. NMFS also reduced the non-sandbar LCS commercial quota by 41.2 mt dw to accommodate the collection of other species besides sandbars collected under the exempted fishing program. Therefore, total landings of sandbars would still be under the 158.3 mt dw TAC (Table A.1), and total landings of non-sandbar LCS would not exceed the 1,045.5 mt dw TAC for non-sandbar LCS (Table A.3).

In addition, given the severity of the overfished and overfishing status of dusky sharks, dusky sharks would not be allowed to be collected for public display. However, based on

research needs and objectives, NMFS would review the allocation of dusky sharks for research under EFPs on a case by case basis. Therefore, reducing the amount of dusky and sandbar sharks and maintaining the number of non-sandbar LCS authorized for these purposes would result in neutral or slightly positive ecological impacts for these species.

4.2.2 Retention Limits

Fishery-wide Landings

Under alternative suite 2 through 4, NMFS would require that shark fins, including the tail, would remain attached to the shark until the first port of landing. At that point, the fins could be removed either by the fisherman or the dealer. The shark could still be headed, gutted, and bled while at sea. To ensure the sharks are stored in a manner that would maximize the value and quality of the sharks, the fins could be sliced as long as they are not removed completely from the shark (*i.e.*, they could remain attached to the shark via a small amount of uncut skin). This would reduce the likelihood of misidentifying the shark or the fins and would help with species-specific reporting by fishermen and dealers to improve data for future stock assessments. Additionally, because fishermen would no longer be able to bypass the regulations by keeping only the fins of shark that are not landed (*i.e.*, keeping more desirable sandbar shark fins and discarding the carcass), fishing mortality of sharks overall could be reduced. This would help with the rebuilding of overfished species of sharks, such as sandbar sharks.

On average, annual sandbar landings of 1,590,917 lb dw and non-sandbar LCS landings of 1,250,638 lb dw were reported from 2003 to 2005 in the Coastal Fisheries and HMS Logbooks by directed and incidental permit holders (Table 4.9). Based on recommendations by the most recent LCS stock assessment, the commercial quota would be reduced to 116.6 mt dw and 541.2 mt dw for non-sandbar LCS (see Appendix A and Tables A.1 and A.3). However, to balance the number of sandbar discards in the South Atlantic with uncaught sandbar quota in the Gulf of Mexico, only 86.1 mt dw of sandbar sharks and 253.6 mt dw of non-sandbar LCS would be landed under alternative suite 2 (see discussion below and in Appendix A under “*Non-sandbar quota and retention limits*” and Tables A.4 and Table 4.2). This is an 88-percent reduction in landings for sandbar sharks and a 56-percent reduction in landings for non-sandbar LCS compared to the status quo, alternative suite 1 (see Table 4.2).

Table 4.2 Landings of sandbar sharks and non-sandbar LCS for the different alternative suites.

Alternative Suite	Estimated Landings by Vessels Within Research Fishery (92 directed shark BLL trips) (mt dw)	Estimated Landings by Shark Permit Holders Outside of Research Fishery (mt dw)	Estimated Landings by Directed Shark Permit Holders (mt dw)	Estimated Landings by Incidental Shark Permit Holders (mt dw)	Estimated Landings by non-HMS Shark Permit Holders in the Coastal Fisheries Logbook (mt dw)	Total Landings (mt dw)	Percent Change in Landings Compared to Status Quo
<i>Sandbar</i>							
1	-	-	713	9	6.1	728	-
2	-	-	86.1	0	†	86.1	↓88%
3	-	-	83.0*	22.9*	†	105.9	↓85%
4	116.6	0	-	-	†	116.6	↓84%
5	-	-	0	0	†	0	↓100%
<i>Non-sandbar LCS</i>							
1	-	-	549	18	15	582	-
2	-	-	253.6	0	†	253.6	↓56%
3	-	-	179.7*	49.5*	†	229.2	↓61%
4	50.2	491	-	-	†	541.2	↓7%
5	-	-	0	0	†	0	↓100%

* See Table 4.11 for this calculation.

† Landings by non-HMS permit holders were counted as discards based on historical landings (see Table 4.1).

Landings on a trip basis

Based on the reduced quotas, the retention limit for alternative suite 2 would be 8 sandbar sharks per vessel per trip and 21 non-sandbar LCS per vessel per trip (~1,032 lb dw per trip for sandbar and non-sandbar LCS) for directed shark permit holders only (incidental permit holders would not be allowed to retain any shark species) (Tables 2.1, A.2, and A.4). Currently, directed shark permit holders are subject to a 4,000 lb dw LCS trip limit. The average number of sandbar and non-sandbar LCS landed per trip was 35 sandbars and 32 non-sandbar LCS for all gear types reported in the Coastal Fisheries and HMS Logbooks. Therefore, the retention limits under alternative suite 2 would be a 77-percent reduction for sandbar sharks and a 34-percent reduction in non-sandbar LCS on a trip basis compared to the status quo. There would be no change to the trip limit for SCS and pelagic sharks for directed shark permit holders (*i.e.*, no trip limit for SCS and pelagic sharks).

Catch composition of sandbar sharks and non-sandbar LCS differed for BLL trips that directed on sharks (Hale and Carlson, 2007). Based on BLL observer program data in 2005 and 2006, on average, 69 sandbar sharks and 35 non-sandbar LCS were caught in the South Atlantic region and 30 sandbar sharks and 83 non-sandbar LCS in the Gulf of Mexico region were caught per trip (Hale and Carlson, 2007). Therefore, depending on the region and gear used, the retention limit in alternative suite 2 could result in a 73 to 88-percent reduction in sandbars kept and a 40 to 75-percent reduction in non-sandbar LCS kept on a trip basis.

Sandbar and non-sandbar LCS discards

The reduction in landings must also be balanced by any potential increase in discards. Since the non-sandbar LCS quota is higher than the sandbar quota, the retention limit for non-sandbar LCS is higher than the retention limit for sandbar sharks (Tables A.2 and A.4). As a result, sandbar sharks could be discarded as fishermen reach their sandbar shark retention limit but continue to fish to fulfill their non-sandbar LCS retention limit. To limit these discards, NMFS based the non-sandbar LCS retention limit on an average ratio of sandbars to non-sandbar LCS caught in the South Atlantic and Gulf of Mexico regions (1:2.7; Table A.4). In doing so, NMFS established a retention limit (21 non-sandbar LCS; Table A.4) that minimized the sandbar discards that could occur in the South Atlantic region while maximizing the sandbar landings that could be caught in the Gulf of Mexico region (since the sandbar to non-sandbar LCS ratio is higher in the Gulf of Mexico region than the South Atlantic region, no sandbar discards are expected in the Gulf of Mexico region given the non-sandbar LCS retention limit).

For instance, the catch ratio of sandbars to non-sandbar LCS in the Gulf of Mexico is 1:4. A non-sandbar LCS retention limit based on this ratio would be 32 non-sandbar LCS per trip with an 8 sandbar shark retention limit per trip (8 sandbars x 4 = 32 non-sandbar LCS). However, given the 1:1.4 ratio in the South Atlantic, an 8 sandbar shark retention limit/trip would equal a 11 non-sandbar LCS retention limit in the South Atlantic (8 sandbar sharks x 1.4 = 11.2 non-sandbar LCS). Therefore, setting one retention limit based on the Gulf of Mexico's catch ratio would result in excessive sandbar sharks discards.

To determine the number of sandbar discards that would occur in the South Atlantic with a non-sandbar LCS retention limit based on the Gulf of Mexico catch composition, NMFS first determined the difference in the retention limits for non-sandbar LCS based on the respective ratios in the two regions. It should be noted that setting a non-sandbar LCS retention limit using the South Atlantic ratio would result in no sandbar discards; any non-sandbar LCS retention limit above that threshold (*i.e.*, above the sandbar shark x 1.4 threshold) would result in sandbar discards, but the number of discards would depend on the difference between the two retention limits divided by South Atlantic's non-sandbar LCS ratio to sandbar sharks (*i.e.*, 1.4):

- Gulf of Mexico non-sandbar LCS retention limit = 8 sandbars x 4 = 32 non-sandbar LCS
- South Atlantic non-sandbar LCS retention limit = 8 sandbar sharks x 1.4 = 11.2 non-sandbar LCS (or 11 non-sandbar LCS)
- 32 non-sandbar LCS retention limit based on Gulf of Mexico ratio - 11 non-sandbar LCS retention limit based on South Atlantic = 21 non-sandbar LCS;
- 21 non-sandbar LCS/1.4 = 15 sandbar sharks discarded per trip in South Atlantic;
- 15 sandbar sharks x 237 South Atlantic trips = 3,555 sandbar sharks discarded in the South Atlantic; and
- 3,555 sandbar sharks x 40.5 lb dw [average commercial sandbar weight] = 143,977.565.3 lb dw or 65.3 mt dw.

Therefore, setting a non-sandbar LCS retention limit in the South Atlantic region based on the Gulf of Mexico region's catch ratio would therefore result in approximately 65.3 mt dw of sandbar shark discards. These discards would occur as fishermen meet their sandbar retention limit and continue to fish to fulfill their non-sandbar LCS retention limit in the South Atlantic.

An alternate approach would be to implement a non-sandbar LCS retention limit based on the South Atlantic catch composition. However, this would translate into approximately only 163.2 mt dw of the 541.2 mt dw of the non-sandbar LCS being harvested (116.6 mt dw sandbar quota x 1.4 = 163.2 mt dw). Another alternative would be to set separate retention limits for the Atlantic and Gulf of Mexico regions. However, as discussed in the Region section below (Section 4.2.6), under alternative suite 2, NMFS would only implement one region due to reduced quotas and to simplify quota monitoring. In addition, there could be difficulty in enforcing different regional retention limits. Therefore, NMFS would establish one retention limit that is applied everywhere. To balance the harvest of as much of the non-sandbar LCS quota as possible while limiting sandbar shark discards, NMFS chose to establish the non-sandbar LCS retention limit based on an average regional catch composition.

However, basing the non-sandbar LCS retention limit on the average regional catch composition still results in a non-sandbar LCS retention limit (*i.e.*, 21 non-sandbar LCS/trip) that is higher than the sandbar to non-sandbar LCS ratio for the South Atlantic (11 non-sandbar LCS/trip), which could result in sandbar shark discards in the South Atlantic (~30.5 mt dw; Table A.4). While this results in total discards that are 4.5 times higher than the number of sandbar discards occurring under the status quo (Table 4.1), these discards are balanced out by the amount of sandbar quota not caught in the Gulf of Mexico region based on the 21 non-sandbar LCS trip limit (~30.5 mt dw; Table A.4). This ultimately results in only 86.1 mt dw of

the sandbar sharks being harvested under alternative suite 2 (*i.e.*, based on the 1:4 ratio in the Gulf of Mexico region, 21 non-sandbar LCS retention limit / 4 = 5 sandbar sharks caught per trip in the Gulf of Mexico region when the non-sandbar LCS retention limit/trip is filled. This is three less than the 8 sandbar shark per trip limit under alternative suite 2, resulting in approximately ~30.5 mt dw of sandbar shark quota uncaught in the Gulf of Mexico region). Furthermore, overall fishing effort is expected to decline compared to the status quo given the reduction in the retention limit of 73 to 88 percent for sandbars and 40 to 75 percent for non-sandbar LCS, depending on the region.

Overall, total landings and discards of sandbar sharks under alternative suite 2 are expected to be 82-percent less (608.3 mt dw) than the total landings and discards under alternative suite 1 (status quo) (Table 4.1 and Table 4.2):

- status quo: 728 mt dw in landings + 9.6 mt dw in discards = 737.6 mt dw total;
- alternative suite 2: 86.1 mt dw in landings + 43.2 mt dw in discards = 129.3 mt dw;
- 737.6 mt dw – 129.3 mt dw = 608.3 mt dw; and
- 608.3 mt dw/737.6 mt dw = 82-percent reduction.

Under alternative suite 2, the total landings and discards plus an estimated 27 mt dw of recreational landings (156.3 mt dw total) is still below the 158.3 mt dw sandbar TAC. Therefore, quotas and retention limits under alternative suite 2 would meet the rebuilding plan for sandbar sharks and would have positive ecological impacts on this stock.

Based on the non-sandbar LCS retention limit under alternative suite 2, landings for this complex would be below the proposed 541.2 mt dw non-sandbar LCS quota (253.6 mt dw of the 541.2 mt dw quota could be caught; Table 4.2 and A.4). Total harvest is anticipated to be below the non-sandbar LCS quota because of the approach taken to set non-sandbar LCS retention limits to limit the number of sandbar shark discards. The only way fishermen could potentially harvest the entire non-sandbar LCS quota would be to reduce sandbar shark landings (*i.e.*, even lower than 86.1 mt dw) to accommodate for presumably more sandbar shark discards with a higher non-sandbar LCS retention limit. Therefore, to balance landings with regulatory discards, NMFS is proposing a ratio approach for setting non-sandbar LCS retention limits, at this time. This retention limit would also decrease non-sandbar LCS discards by an estimated 56 percent under this alternative suite (Table 4.1). This is mainly due to the assumption that the lowered retention limits for sandbars and non-sandbar LCS may result in fishermen not directing on sharks with the same level of effort as they have been in the past. Therefore, non-sandbar LCS discards by shark directed BLL trips may decrease (Table 4.1). If these assumptions reflect actual changes in the fishery, then alternative suite 2 would have positive ecological impacts for non-sandbar LCS.

Dusky shark discards

It is also assumed that the reduction in fishing effort due to the reduced sandbar and non-sandbar LCS quotas under alternative suite 2 could result in a decrease of dead discards of dusky sharks, resulting in positive ecological impacts for this stock. Dusky sharks have been prohibited

since 2000; however, they are still being landed or discarded dead as reported in the Coastal Fisheries and HMS Logbooks. Landings are also occurring in recreational fisheries. Under alternative suite 1 (status quo), it is estimated that, on average, 33.2 mt dw of dusky sharks have been landed or discarded dead (this includes recreational harvest) from 2003 to 2005 (Table 4.1). The majority of the discards under the status quo came from shark directed BLL sets (which include BLL sets fished by PLL vessels) (Table 4.1). However, mortality of dusky sharks would still be realized by other parts of the commercial and recreational fishing sector (Table 4.1). As with non-sandbar LCS, it is assumed that since retention limits for sandbars and non-sandbar LCS have been reduced, fishermen would not be directing their effort on shark as they have in the past. This is particularly pertinent for alternative suite 2, which would prohibit landings of sandbar sharks when PLL gear is onboard a vessel. Therefore, it is assumed that PLL vessels would not set BLL gear for sharks as a result of this prohibition. Given this assumption and the reduced fishing effort for sandbar and non-sandbar LCS, it is estimated that alternative suite 2 may reduce dusky shark discards and landings by 74 percent (Table 4.1).

Porbeagle shark discards

Finally, under alternative suite 2, porbeagle sharks would be prohibited in the commercial and recreational sectors. This is expected to have neutral or slightly positive ecological impacts for this stock. The United States has minimal landings of this species. Based on HMS Logbook data from 2001 to 2005, 1,895 porbeagle sharks were reported discarded alive, 558 were reported as discarded dead, and 78 were reported as being kept over those 5 years. Based on the number of porbeagle sharks kept from 2001 to 2005, U.S. fishermen have not been targeting porbeagle sharks. Since only 3 percent of the porbeagle sharks that were initially caught were discarded dead ($1,895 \text{ discarded alive} + 558 \text{ discarded dead} + 78 \text{ kept} = 2,531 \text{ total porbeagle sharks caught}$; $558 \text{ discarded dead} / 2,531 \text{ total catch} = 3 \text{ percent discarded dead}$), prohibiting the retention of porbeagle sharks is not expected to result in large numbers of dead discards. In fact, dead discards of porbeagle sharks may only increase by 2 porbeagle sharks over 5 years or 0.4 porbeagle sharks per year ($3 \text{ percent} \times 78 \text{ porbeagle sharks kept} = 2 \text{ porbeagle sharks discarded dead under alternative 2}$; $2 \text{ porbeagle sharks} / 5 \text{ years} = 0.4 \text{ porbeagle per year}$). Given this stock is overfished, prohibiting the retention of this species would eliminate any future fishery from developing while not increasing dead discards. This may result in slightly positive ecological impacts for this stock. In addition, since most porbeagle sharks are caught on PLL gear, reductions in fishing effort associated with BLL gear are not anticipated to have significant ecological benefits for this species.

4.2.3 Time/Area Closures

Under alternative suite 2, NMFS would maintain the mid-Atlantic shark closed area and the current BLL closures in the Caribbean that were implemented in February 2007, (72 FR 5633). Therefore, the ecological impacts associated with the closures would be the same as described under alternative suite 1.

However, under alternative suite 2, NMFS would also implement the SAFMC's MPAs. The SAFMC has proposed a number of Type II MPAs from North Carolina to the Florida Keys in Amendment 14 to the Snapper Grouper FMP (Figure 4.3). Type II MPAs are closures throughout the year to most gear types except some fishing such as trolling for HMS and other

coastal pelagic species that is allowed. Recent stock assessments indicate that snowy grouper, black seabass, and red porgy are overfished and snowy grouper, golden tilefish, vermilion snapper, and black sea bass are experiencing overfishing. The primary purpose of Amendment 14 is to protect the population and habitat of slow growing, long-lived deepwater snapper grouper species (speckled hind, snowy grouper, Warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish) from directed fishing pressure to achieve a more natural sex ratio, age, and size structure within the proposed MPAs while minimizing adverse social and economic impacts. A total of 19 MPAs were initially considered in Amendment 14, and 8 of the MPAs were preferred in the SAFMC’s final actions in June 2007. The only HMS authorized gear that has the potential to interact with the species the SAFMC is concerned about in Amendment 14 is BLL gear. HMS permitted vessels that fish with BLL gear normally target LCS, but small coastal, pelagic and dogfish species are also caught. Bycatch may include groupers, tilefishes, wahoo, skates, rays, and other species (Table 4.3).

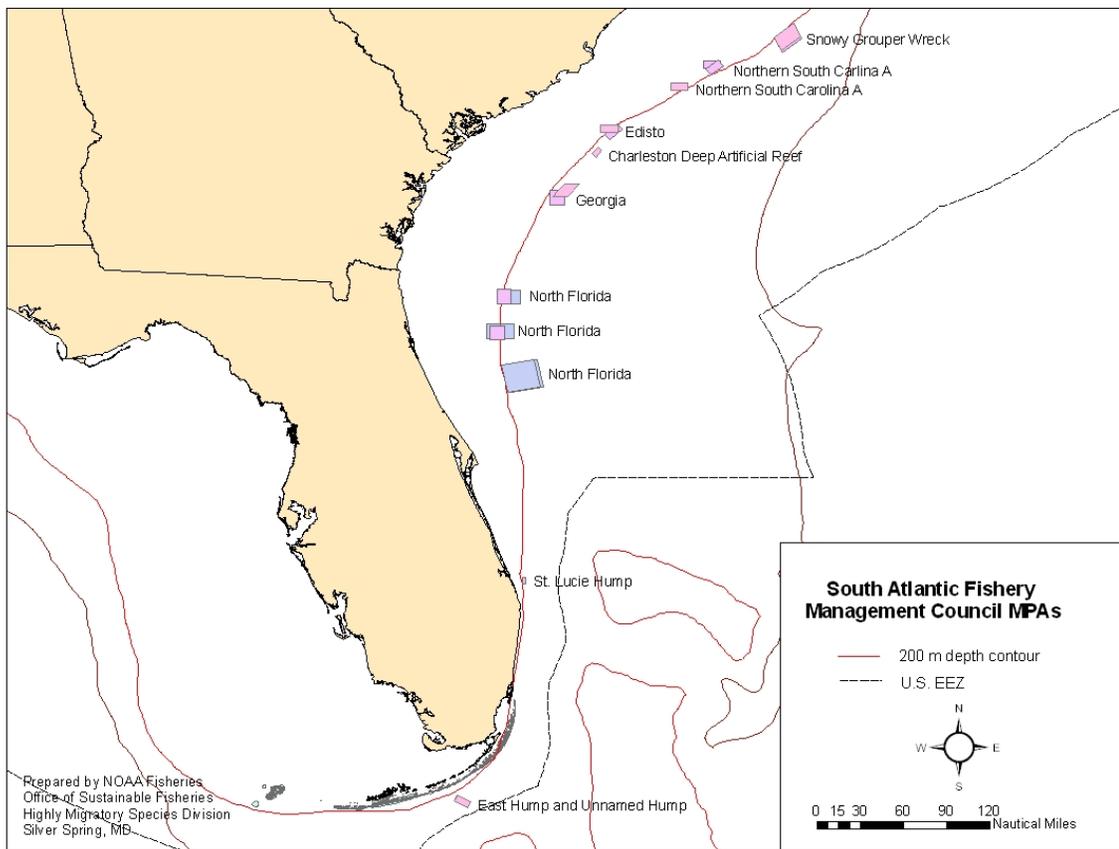


Figure 4.3 Map showing all MPAs considered by the South Atlantic Fishery Management Council in Amendment 14. Several of the MPAs represent a number of different alternatives with the same name that overlap slightly.

Table 4.3 Bycatch species (number and percentage of total) caught on observed shark BLL sets from 1994-2006 in all the MPAs in comparison to observed bycatch in the rest of the Atlantic. Groupers are highlighted and total provided separately. Source: Shark BLL Observer Program, NMFS.

Common Name	Number Caught in All MPAs	Number Caught in Atlantic	Percent In MPAs
almaco jack	1	7	14.3%
basket star	1	1	100.0%
black sea bass	0	11	0.0%
box crab	2	6	33.3%
brittle star	4	13	30.8%
clearnose skate	2	76	2.6%
cobia	2	121	1.7%
conger eel	1	8	12.5%
gag grouper	18	74	24.3%
grouper	1	121	0.8%
leopard toadfish	2	2	100.0%
mahi	3	8	37.5%
red grouper	6	186	3.2%
reticulate moray	1	1	100.0%
sharksucker	3	66	4.6%
skate	1	55	1.8%
smalltooth sawfish	1	10	10.0%
snowy grouper	2	40	5.0%
starfish	1	52	1.9%
stingray	5	168	2.9%
tilefish	0	605	0.0%
wahoo	3	6	50.0%
warsaw grouper	1	8	12.5%
yellowfin grouper	1	3	33.3%
Grand Total	62	1,648	3.8%
Total Groupers	29*	1,048	2.8%

* based on the sum of gag grouper, grouper, red grouper, snowy grouper, warsaw grouper, and yellowfin grouper

In the DEIS for Amendment 14 the eight preferred MPAs include one off southern North Carolina, three off South Carolina, one off Georgia, and three off Florida with specific locations described below (Figure 4.4):

1) Snowy Grouper Wreck off North Carolina in the area that is bound by the following coordinates: The northwest corner at 33°25'N, 77°4.75'W; northeast corner at 33°34.75'N, 76°51.3'W; southwest corner at 33°15.75'N, 77°W; and the southeast corner at 33°25.5'N, 76°46.5'W.

2) Northern South Carolina MPA (South Carolina A MPA) in the area bounded by the following coordinates: The northwest corner at 32°53.5'N, 78°16.75'W; the northeast corner at 32°53.5'N, 78°4.75'W; the southwest corner at 32°48.5'N, 78°16.75'W; and the southeast corner at 32°48.5'N, 78°4.75'W.

3) Edisto MPA in the area bounded by the following coordinates: The northwest corner at 32°24'N, 79°6'W; the northeast corner at 32°24'N, 78°54'W; the southwest corner at 32°18.5'N, 79°6'W; and the southeast corner at 32°18.5'N, 78°54'W (formerly named “Proposed SC A(5)”)

4) Georgia MPA (Tilefish MPA) in the area bounded by the following coordinates: The northwest corner at 31°43'N, 79°31'W; the northeast corner at 31°43'N, 79°21'W; the southwest corner at 31°34'N, 79°39'W; and the southeast corner at 31°34'N, 79°29'W (formerly named “Proposed GA(3)”)

5) North Florida MPA (Jacksonville/St. Augustine Ridge MPA) in the area bounded by the following coordinates: The northwest corner at 30°29'N, 80°14'W; the northeast corner at 30°29'N, 80°2' W; the southwest corner at 30°19'N, 80°14'W; and the southeast corner at 30°19'N, 80°2'W

6) St. Lucie Hump MPA in the area bounded by the following coordinates: The northwest corner at 27°8'N, 80°W; the northeast corner at 27°8'N, 79°58'W; the southwest corner at 27°4'N, 80°W; and the southeast corner at 27°4'N, 79°58'W (formerly named “Sea Bass Rocks (4)”)

7) East Hump/Un-named Hump MPA in the area bounded by the following coordinates: The northwest corner at 24°36.5'N, 80°45.5'W; the northeast corner at 24°32'N, 80°36'W; the southwest corner at 24°32.5'N, 80°48'W; and the southeast corner at 24°27.5'N, 80°38.5'W

8) Charleston Deep Artificial Reef MPA off the Coast of South Carolina in the area identified by the following boundaries: The northwest corner at 32°08.58'N, 79°07.82'W; the northeast corner at 32°06.06'N, 79°04.99'W; the southwest corner at 32°04.07'N, 79°12.11'W; and the southeast corner at 32°01.47'N, 79°09.28'W.

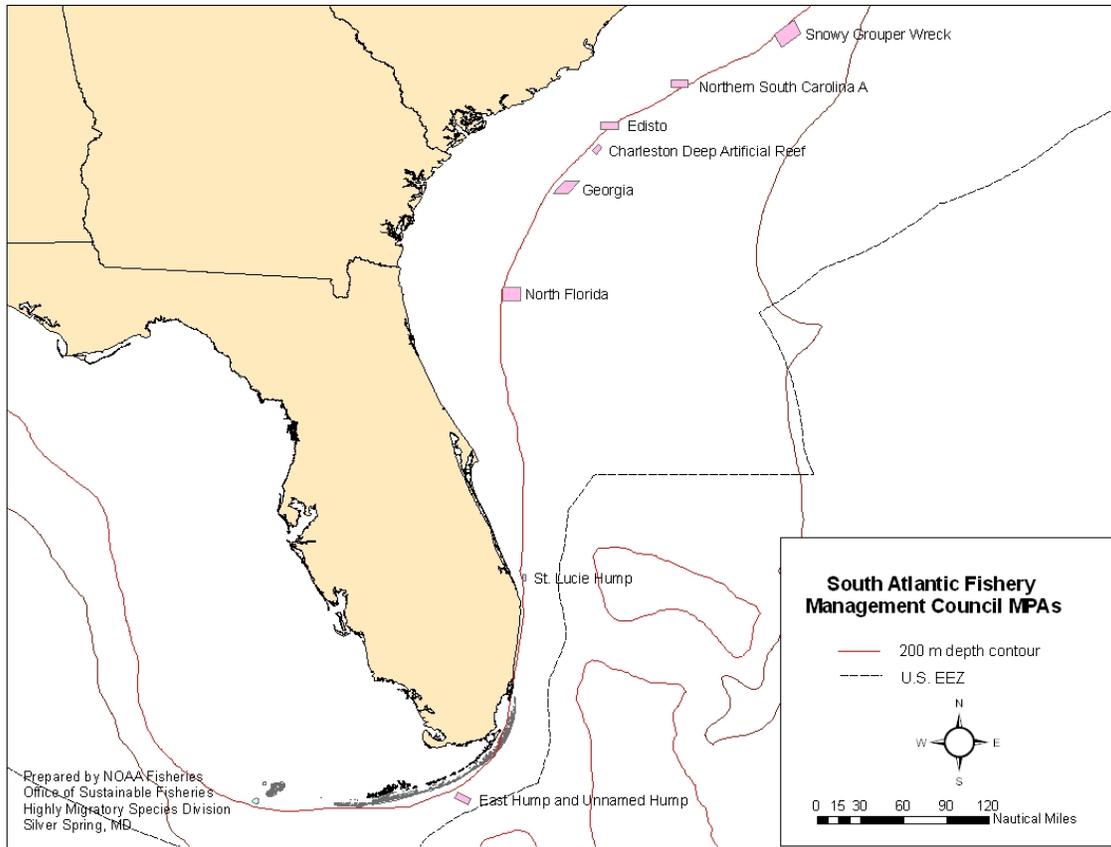


Figure 4.4 Map showing only the preferred SAFMC MPAs. A total of eight MPAs were preferred in SAFMC’s final action for Amendment 14.

NMFS agreed to coordinate with the SAFMC to analyze the ecological and socio-economic impacts of the MPAs on HMS fisheries in Amendment 2 and to consider rulemaking to prohibit shark BLL gear in the preferred MPAs. This approach should result in implementation of measures consistent with the SAFMC process and the current timeline for Amendment 14. NMFS has addressed a number of SAFMC actions in a similar way including the Gulf of Mexico Madison-Swanson Steamboat Lumps closures and the Caribbean SFA closures.

As described below, the ecological impact of shark BLL gear on the snapper grouper complex is considered to be minimal, and catches of sharks in the area are also low compared to other areas of the South Atlantic. Thus, the ecological consequences of closing the eight preferred MPAs are considered to be minimal. Under alternative suite 2, NMFS would close the preferred to MPAs to shark BLL gear based on enforceability concerns raised by the SAFMC.

NMFS used shark BLL observer program data from 1994 to 2006 to evaluate the impact of the shark BLL fishery on the snapper-grouper complex within the proposed MPAs. Using a Geographic Information System (GIS), NMFS plotted the locations of all observed sets on the all the proposed MPAs originally considered in the South Atlantic region (Figure 4.5 and Figure 4.6). The figures provide an overview of the number and locations of sets that intersected all the MPAs originally considered. The northernmost areas are shown in Figure 4.5 and the

southernmost areas are shown in Figure 4.6. The points on the maps indicate the beginning and ending locations (reported as degrees and minutes of latitude and longitude by observers) of the sets connected by a line between the two points. Since most of the proposed MPAs are relatively small (<10 nautical miles in diameter), the sets tend to either start or end outside of the MPAs. In most cases, only a portion of the set intersected with an MPA and few, if any sets, were entirely within the MPAs (Figure 4.7). However, if a set intersected any portion of an MPA, then all bycatch reported on that set was counted as occurring in the MPA regardless of where on the set it occurred. NMFS used this approach because it was not possible to determine where on a set the bycatch actually occurred. Of the sets that intersected the MPAs, a large portion of each set actually occurred primarily outside the MPAs. As a result, the number of bycatch species reported as occurring in the MPAs is most likely an overestimate.

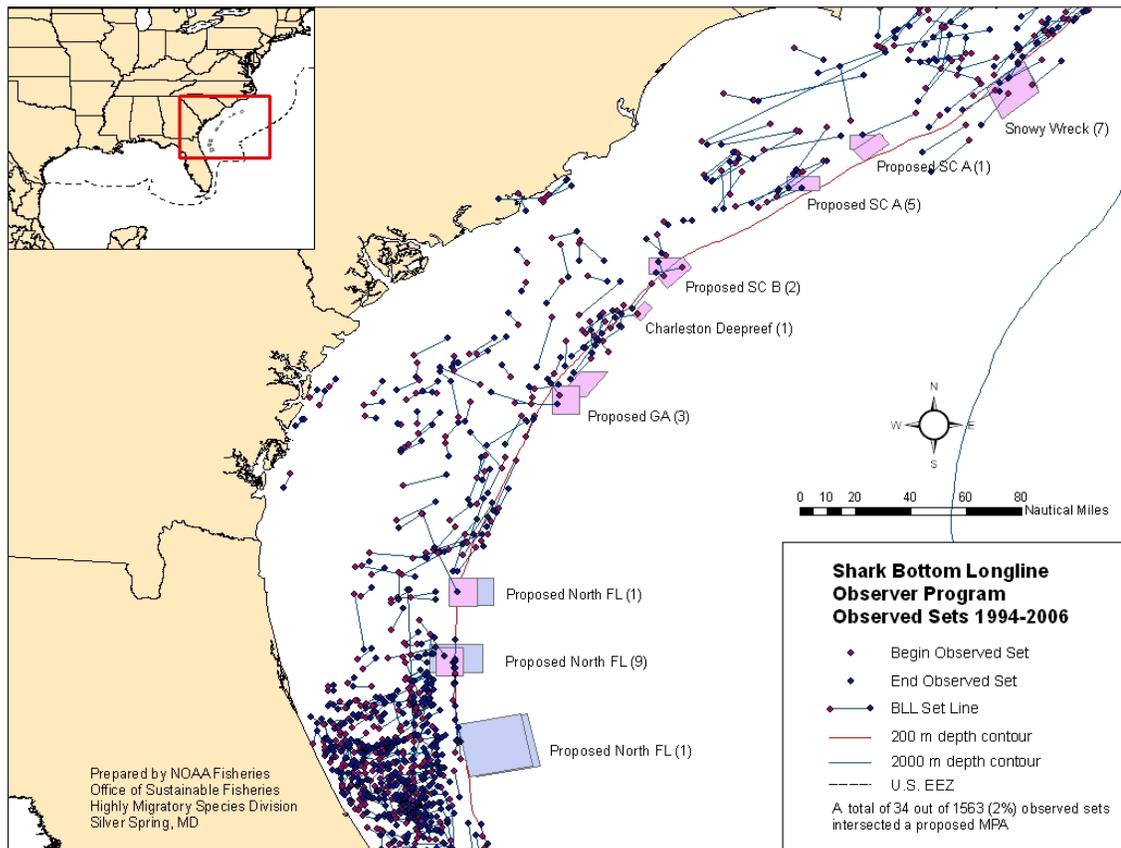


Figure 4.5 All shark BLL sets observed from 1994-2006 overlaid on the MPAs originally considered for the northern zone. A total (both northern and southern zones) of 34 out of 1,563 (2%) of observed sets intersected the considered MPAs. Note that most sets are shoreward of the 200 m depth contour. Source: Shark BLL Observer Program, NMFS.

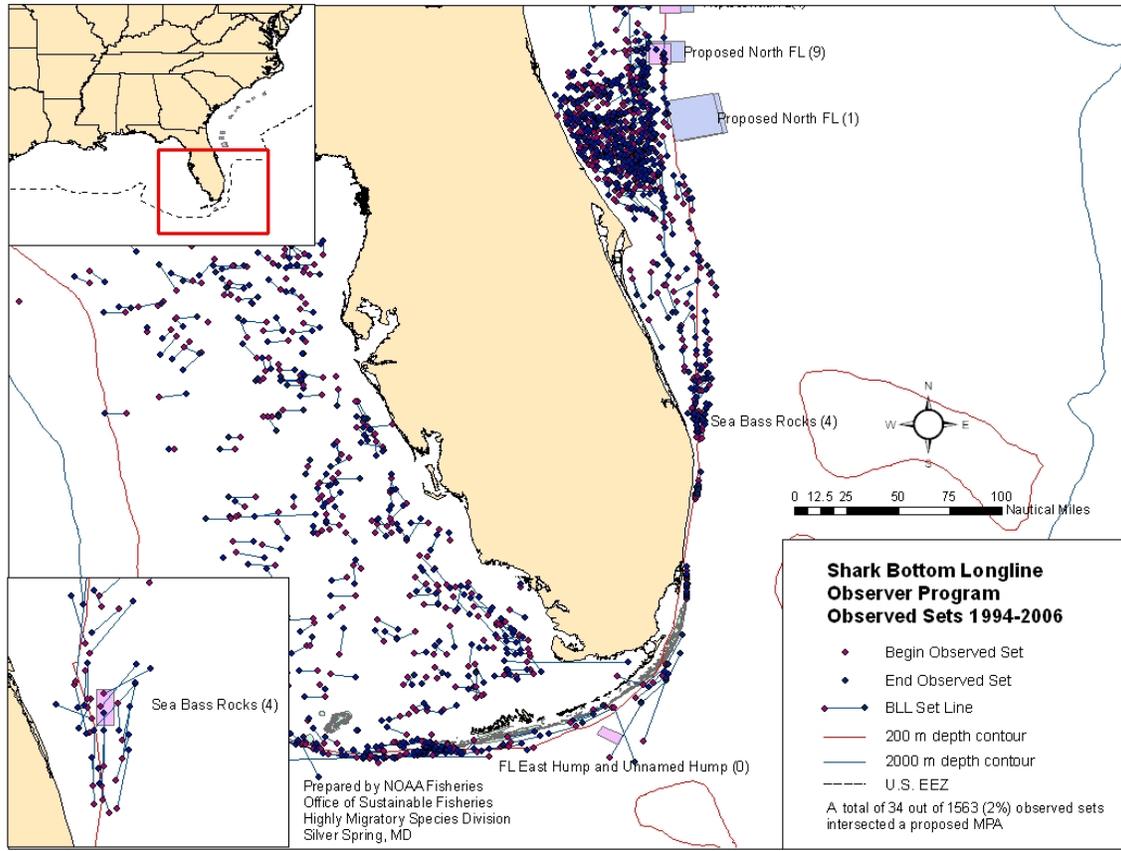


Figure 4.6 All shark BLL sets observed from 1994-2006 overlaid on the MPAs originally considered for the southern zone. Source: Shark BLL Observer Program, NMFS.

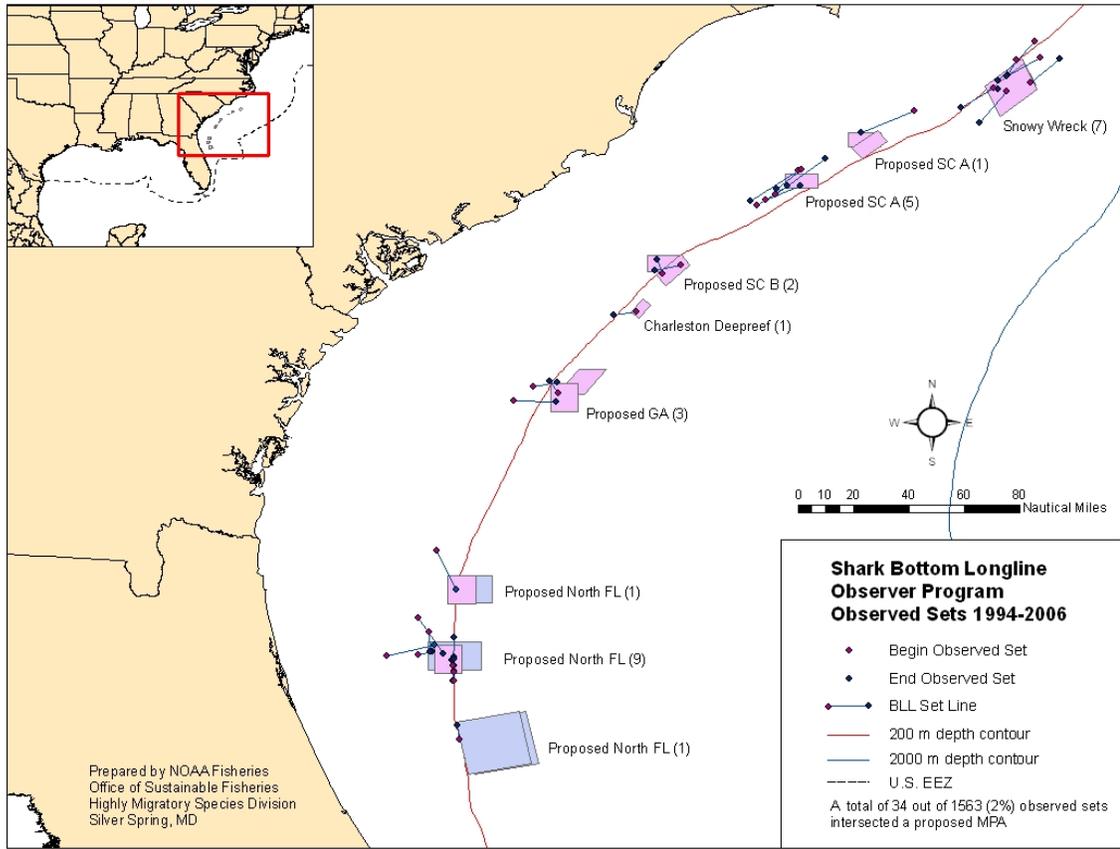


Figure 4.7 Observed shark BLL sets that intersected MPAs originally considered in the northern zone. Source: Shark BLL Observer Program, NMFS.

Of the 1,563 observed sets over the approximately twelve-year period, a total of 34 sets intersected the proposed MPAs that were originally considered by the SAFMC (Figure 4.7 and Table 4.3). Of those, only two sets occurred entirely within the boundary of the MPAs (one in Snowy Grouper Wreck and one in North Florida MPA). A concentration of observed sets is apparent in the areas north of Cape Canaveral. The remaining sets tend to be more widely spaced and although observer coverage is not necessarily uniform, the level of observer coverage was based on the level of fishing effort in the different areas. Each MPA has a number next to it in parentheses that indicates the number of observed sets that intersected the MPA.

Figure 4.8 and Figure 4.9 show only those sets that intersected the MPAs that were originally considered. The Snowy Grouper Wreck MPA had the highest number of observed sets with seven (Figure 4.7 and Figure 4.8). The middle sites for North Florida had nine sets. Most of them had one, two, or fewer than three sets in any given MPA. Table 4.3 and Table 4.4 show all of the bycatch and all of the sharks, respectively, that were caught on sets that may have intersected an MPA. As evident from Figures 4.5 and 4.6, few sets occurred in the MPAs because they are located on the edge of the shelf in deeper water where currents are strong and gear may be lost. Most BLL sets occur shoreward of the 200 m depth contour with the exception of the Snowy Grouper Wreck MPA (Figure 4.7). The few sets that did occur in the MPAs should not be considered representative of overall shark fishing effort, and may in fact be considered anomalous based on the low number of observed sets that occurred in these areas.

Only 34 sets (2 percent) of the 1,563 observed sets occurred in the MPAs that were originally considered by the SAFMC. The fact that very few sets occurred in the MPAs supports the argument that there is very little shark fishing effort and associated bycatch in the MPAs, and hence, supports the overall conclusion of minimal ecological impacts.

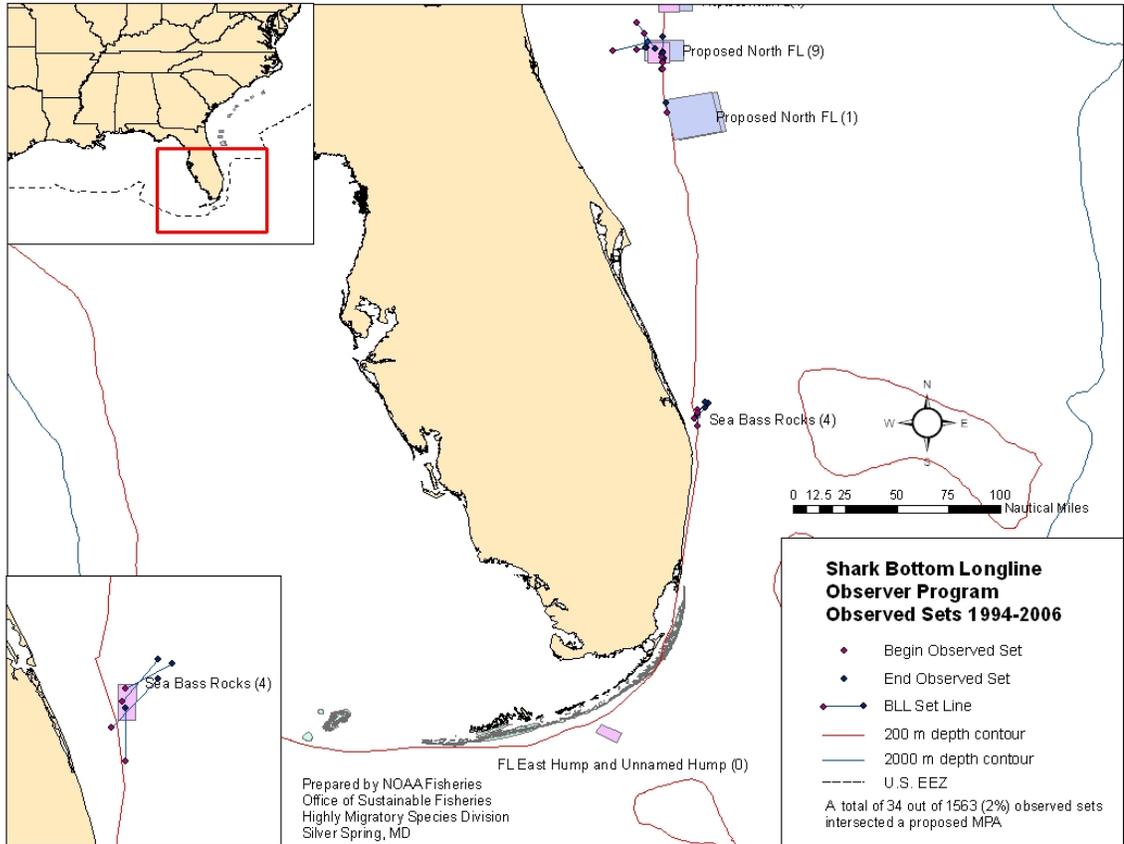


Figure 4.8 Observed shark BLL sets that intersected MPAs originally considered in the southern zone. Source: Shark BLL Observer Program, NMFS.

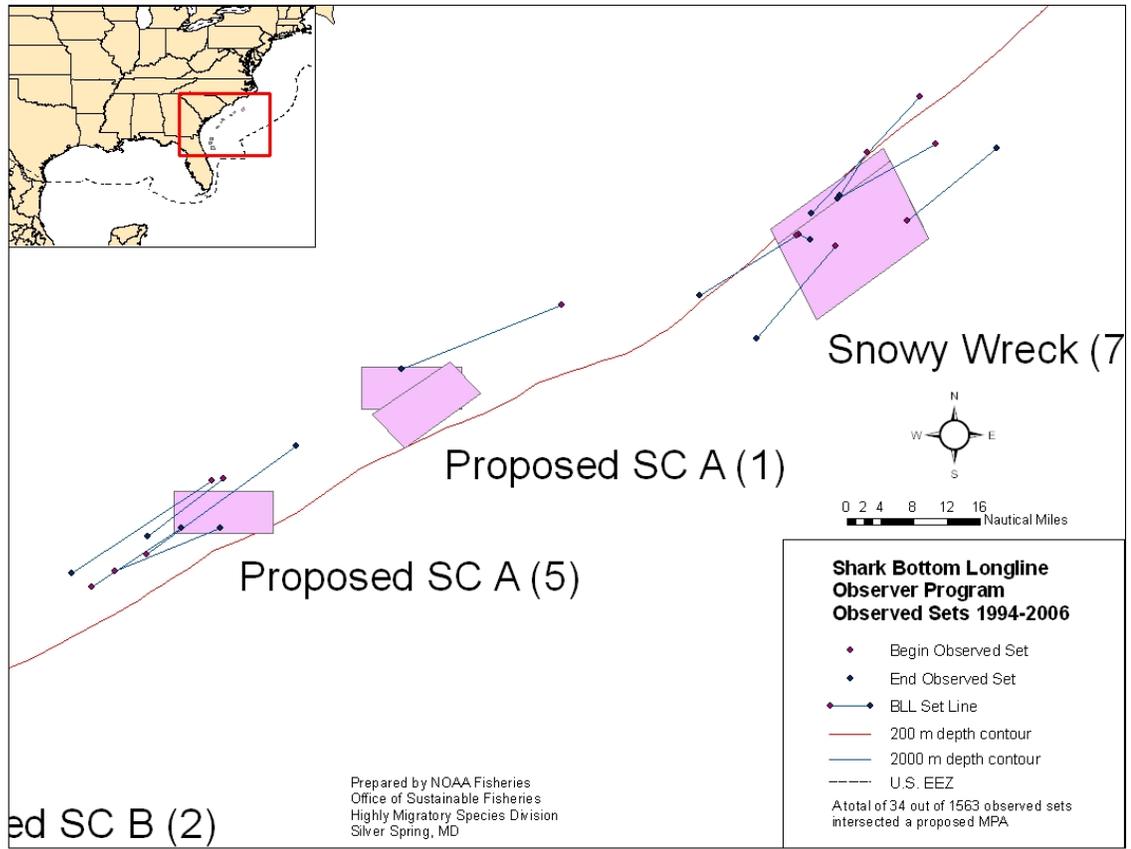


Figure 4.9 Close-up showing the extent of overlap of sets with the MPAs. The number of sets that intersected the MPAs is in parentheses. Since at least one end of each set intersected the MPAs, all bycatch on the sets was considered to have occurred inside the MPAs. Source: Shark BLL Observer Program, NMFS.

Table 4.4 Shark species (number and percentage of total) caught on observed shark BLL sets from 1994-2006 in all the MPAs in comparison to observed shark catch during the same period in the rest of the Atlantic. Source: Shark BLL Observer Program, NMFS.

Species	Number Caught in All MPAs	Number Caught in Atlantic	Percent of Total
Atlantic sharpnose	75	14,836	0.5%
bigeye thresher	12	21	57.1%
blacknose	47	1,116	4.2%
bull	5	194	2.6%
Carcharhinus spp	1	13	7.7%
dusky	32	1,736	1.8%
great hammerhead	6	251	2.4%
lemon	2	98	2.0%
night	2	145	1.4%
nurse	4	945	0.4%
sand tiger	1	410	0.2%
sandbar	1,012	19,849	5.1%
scalloped hammerhead	29	61	47.5%
shortfin mako	5	105	4.8%
silky	30	544	5.5%
sixgill	1	6	16.7%
smooth dogfish	1	538	0.2%
spinner	2	220	0.0%
tiger	549	6,929	7.9%
unidentified	1	11	9.1%
Grand Total	1,817	48,028	3.8%

NMFS attempted to estimate the total bycatch within the proposed MPAs (Siegfried *et al.* 2006a). NMFS also expanded coastal shark catches to obtain overall estimates of sharks caught within the proposed MPAs (Siegfried *et al.* 2006b). NMFS used the observed bycatch in the MPAs and fishing effort reported in the Coastal Fisheries Logbook to provide expanded take estimates (Siegfried *et al.* 2006a). The proposed MPA total areas were calculated as proportions of each grid used to report fishing effort in the Coastal Fisheries Logbook. NMFS then calculated the proportion of sets with bycatch using a generalized linear model (GLM). Thus, the bycatch estimates reflect a subset of the actual shark BLL effort in these areas, as opposed to all effort in the Atlantic. Only one MPA, Snowy Wreck, had sufficient data to produce expanded bycatch estimates. Low sample sizes prohibited estimating the impact of the shark BLL fishery on bycatch in other MPAs in a statistically robust fashion (Siegfried *et al.*, 2006a). A similar approach was used to estimate total shark catches in the MPAs (Siegfried *et al.*, 2006b).

Due to the small amount of bycatch that occurred in the MPAs, it was not possible to calculate expanded estimates for most MPAs. Based on the low estimate of total expanded bycatch, it is likely the shark BLL fishery has minimal impact on the proposed MPAs. If

additional data becomes available, expanded take estimates could be calculated for those MPAs for which NMFS was unable to provide estimates in the current analysis. It should be noted that the shark observer program is one of the most comprehensive, long-term, and well documented datasets available. Similar observer program data are not available for the snapper grouper fishery. Although data from the Coastal Fisheries Logbook were used to derive expanded take estimates, they do not provide specific latitude and longitude coordinates of set locations to determine the exact bycatch that occurred in MPAs. Siegfried *et al.* (2006b) used a similar approach to estimate expanded catches of sharks. Sharks catches were considerably higher than snapper grouper bycatch and data were thus sufficient to produce expanded estimates.

Given that only 34 out of 1,563 observed trips (2 percent) intersected the MPAs that were originally considered, the impact of shark longline vessels on the snapper grouper complex in the MPAs is expected to be minimal. Taking all 34 sets that occurred in the MPAs into account, only 28 grouper were observed caught over a 12 year period (Table 4.3). Of these, only one species that was observed caught (snowy grouper) is from a stock that is considered overfished with overfishing occurring. Two individuals of this species were caught (Table 4.3). As described above, NMFS attempted to calculate the expanded bycatch of snapper grouper in the MPAs but was able to do so for only one MPA (Snowy Grouper Wreck). For Snowy Grouper Wreck MPA, NMFS estimated that 0.0061 snapper-grouper for grid 3376 per thousand hooks and 0.0586 per thousand hooks for grid 3377 would be caught.

A total of 1,816 sharks, or 2.6 percent of the total number of sharks observed, were observed caught on sets that intersected the MPAs originally considered by the SAFMC (Table 4.4). Based on expanded catch estimates, a total of 25,395 sharks were estimated to be caught in the MPAs each year (Table 4.5). NMFS is addressing overall quotas and retention limits in separate alternatives. If the MPAs were closed to BLL gear, this could have a positive impact on shark populations by reducing overall mortality and landings of sharks in the South Atlantic. The total number of sharks caught annually in the MPAs is likely an overestimate because most of the catch recorded on the sets did not occur entirely within the MPA as described above. Thus, the actual number of sharks caught in the MPAs may be lower.

For the eight preferred MPAs (Figure 4.4), only 21 fish (4.8 percent of total) were reported as bycatch, and of those, only 13 individuals were comprised of grouper species (Table 4.6). No snowy grouper were observed caught in the preferred MPAs. For sharks, 818 sharks were observed caught in the preferred eight MPAs (1.6 percent of total) with the majority of the catch comprised of sandbar shark (Table 4.7).

Table 4.5 Expanded take estimates for sharks by number per year for proposed MPAs. Source Siegfried *et al.*, 2006b.

Grid	MPA Included	Percent of Grid Area for Each MPA	Estimated Number of Sharks Caught Per Year
2480	East Hump / Unnamed Hump	1.45	840
2779	St Lucie Hump	0.22	93
2979	North Florida	6.65	583
	North Florida	5.29	463
2980	North Florida	0.00	0
	North Florida	5.68	7144
	North Florida	1.39	1751
	North Florida	7.04	8856
3080	North Florida	2.78	817
	North Florida	1.38	406
	North Florida	3.34	980
	North Florida	1.39	407
3179	Georgia	2.50	298
	Georgia	2.78	331
3277	Northern South Carolina	0.05	1
3278	Edisto	0.92	456
	Edisto	1.37	683
	Northern South Carolina	1.66	825
3279	Edisto	0.92	284
	Edisto	0.24	73
3376	Snowy	3.92	24
	Snowy	4.17	26
3476	Charleston artificial reef	0.18	54
	Total		25,395

Table 4.6 Bycatch species (number and percentage of total) observed caught on shark BLL sets in the preferred MPAs in comparison to observed bycatch in the rest of the Atlantic. Groupers are highlighted and total provided separately. Source: Shark BLL Observer Program, NMFS.

Common Name	Number Caught in Preferred MPAs	Number Caught in Atlantic	Percent of Total
brittle star	1	13	7.7%
cobia	1	121	0.8%
conger eel	1	8	12.5%
gag grouper	8	74	10.8%
mahi	1	8	12.5%
red grouper	3	186	1.6%
reticulate moray	1	1	100.0%
skate	1	55	1.8%
stingray	1	168	0.6%
wahoo	1	6	16.7%
warsaw grouper	1	8	0.0%
yellowfin grouper	1	4	25.0%
Grand Total	21	652	4.8%
Total Groupers	13	272	4.8%

Table 4.7 Shark species (number and percentage of total) caught on observed shark BLL sets in the preferred MPAs. Source: Shark BLL Observer Program, NMFS.

Species	Number Caught in Preferred MPAs	Number Caught in Atlantic	Percent of Total
Atlantic sharpnose	17	14,836	0.1%
bigeye thresher	12	21	57.1%
blacktip	43	2,716	1.6%
bull	3	194	1.5%
Carcharhinus spp	1	13	7.7%
dusky	27	1,736	1.6%
great hammerhead	2	251	0.8%
lemon	2	98	2.0%
night	2	145	1.4%
nurse	1	945	0.1%
sand tiger	1	410	0.2%
sandbar	530	19,849	2.7%
scalloped hammerhead	27	61	44.3%
shortfin mako	4	105	3.8%
silky	14	544	2.6%
smooth dogfish	1	538	0.2%
spinner	2	220	0.9%
tiger	128	6,929	1.8%
unidentified	1	11	9.1%
Grand Total	818	49,622	1.6%

The SAFMC has expressed concern about habitat impacts of shark BLL gear in the MPAs. In the Consolidated HMS FMP, NMFS completed a review of all HMS (and other state and Federally managed gears) that may have an impact on HMS EFH. In addition, NMFS considered the impact of HMS gears on EFH for other Federally managed species. NMFS concluded that BLL gear was the only gear that has the potential to impact EFH, specifically benthic habitat types. However, the degree to which the gear would impact EFH also depends on the substrate that makes up the EFH. Certain substrates, such as complex coral reef habitat, would be more susceptible to damage than would mud and sand substrates because of the extended time for habitat recovery. The impact of shark BLL gear on benthic habitat has not been rigorously studied and conclusions are mixed. For example, the 1999 NMFS EFH Workshop categorized the impact of BLL gear on mud, sand, and hard-bottom as low (Barnette 2001). BLL gear may have some negative impact if gear is set in more complex habitats, such as sponges or coral reefs, however only small portions of some of the MPAs are characterized as being comprised of hard bottom and none of the areas are considered to have sponge or coral habitat. BLL gear in the shark fishery is primarily used in sandy and/or mud habitats where it is expected to have minimal impacts.

On November 7, 2006, NMFS published a Notice of Intent (71 FR 65088) to prepare an Environmental Impact Statement to examine management alternatives for revising existing HMS EFH, consider additional Habitat Areas of Particular Concern (HAPCs), and to identify ways to avoid or minimize, to the extent practicable, adverse fishing impacts on EFH consistent with the

Magnuson-Stevens Reauthorization Act and other relevant Federal laws. In the amendment, NMFS would consider the impact of BLL gear on EFH. Depending on the outcome of the analysis, NMFS may consider alternatives to prohibit BLL if it is found to have more than a minimal and not temporary impact on EFH. Factors that NMFS would consider include the overlap of BLL gear with EFH, the duration and extent of the impact, and the susceptibility of the habitat to damage from BLL gear consistent with previous guidance issued by NMFS.

The SAFMC has also expressed concerns about the enforceability of prohibiting only snapper/grouper BLL gear and not shark BLL gear in the MPAs. Since the gears are virtually indistinguishable, and many fishermen hold both types of permits, prohibiting only one type of gear could create an enforcement loophole. Thus, based on enforcement concerns, NMFS would close the preferred MPAs to shark BLL gear under alternative suite 2.

4.2.4 Reporting

This alternative suite would increase dealer reporting frequency, resulting in positive ecological impacts. Shark dealer reports are the basis for monitoring commercial shark quotas. Increasing the reporting frequency for dealers from bimonthly, to reports *received* within 24 hours of when shark products were purchased would provide the Agency with more “real-time” data on the quantity of sharks being landed relative to their respective quotas. Quotas for sandbar sharks would be much lower than in the past, therefore, increased reporting frequency would enhance the Agency’s ability to provide landings updates and possibly close fisheries, if necessary, to prevent overharvests. Effectiveness of increased reporting requirements for shark dealers would be contingent upon shark dealers understanding their responsibilities and submitting data in a timely manner. Reporting requirements for dealers would be closely linked with fishing seasons. Shark fisheries for sandbar and non-sandbar LCS would *both* be closed once the fishery lands 80 percent of *either* quota; therefore, getting this information as soon as possible would reduce the likelihood of allowing fishing to take place after a quota has been met. Other reporting requirements, including the need to take an observer if selected and submission of vessel logbooks, would remain the same.

This alternative suite would also modify how unclassified sharks are accounted for by the Agency regarding quota monitoring. Currently, all sharks that are listed on shark dealer reports as unclassified are counted against the LCS quota. Alternative suites 2 through 4 would modify this procedure to ensure that shark dealers do not intentionally mis-report and take the time to properly identify what species of sharks they are purchasing from fishermen. These suites would change the regulations to count all unclassified sharks against the sandbar shark quota. This is the smallest commercial quota for any species complex and these sharks are also the most valuable because of their fins. By counting all unclassified sharks as sandbar sharks, positive ecological impacts are expected. This change may reduce the likelihood of exceeding the sandbar and/or non-sandbar LCS quota and might encourage shark fishermen to properly identify what they are landing without providing the incentive to mis-report in order to keep the sandbar fishery open longer. Mandatory shark identification workshops for dealers coupled with the requirements to leave all fins on all sharks is expected to improve species specific reporting for sharks which may improve quota monitoring, stock assessments, and the utility of data attained from shark dealers and vessel owners.

4.2.5 Seasons

This alternative suite would open all shark fisheries when this amendment becomes effective in 2008. On January 1, 2008, until the effective date of this amendment all of the Atlantic shark fisheries would be closed. Atlantic shark fisheries would open on January 1 in 2009 and thereafter, depending upon available quota. Seasons would be closed within 5 days notice (*i.e.*, within 5 days of filing with the Federal Register) of any quota being 80 percent filled in effort to prevent overfishing. Seasons for non-sandbar LCS and sandbar sharks would both close when either quota reaches 80 percent of their respective quota because of concerns regarding sandbar shark bycatch that might occur if the non-sandbar LCS fishery were kept open after the sandbar quota had been filled. The Agency wants to prevent individual from mis-labeling sandbar sharks as non-sandbar LCS in order to keep the sandbar shark fishery open longer. Furthermore, all shark dealer reports listing unclassified sharks would be counted as sandbar sharks to encourage dealers to properly identify what sharks they are purchasing. Seasons for SCS and pelagic sharks would be closed individually upon achieving 80 percent of their respective quotas. Upon achieving 80 percent of landings, fishermen would be given 5 days notice from the date of filing with the Office of the Federal Register prior to the closure. Official notice would be made via the Federal Register, however, the public would also be informed simultaneously via the HMS website and email notice listserve. Fishing effort might increase as a result of providing this 5-day advance notice as fishermen and dealers would know that the season is ending; however, they would still be bound by the retention limits for individual trips as described in Section 4.2.1.

Commercial shark fisheries have been managed on a trimester basis since 2003 because they provide a higher degree of resolution on which to manage seasonal fisheries. Furthermore, trimesters may reduce fishing mortality during peak pupping seasons and may be used to address other bycatch concerns. As described above, this alternative suite would implement reduced quotas and retention limits for sandbar sharks, which is one of the most valuable sharks in commercial fisheries because of its fin value. It is estimated that the reductions in fishing effort as a result of these reduced retention limits and quotas could provide ecological benefits to all shark species. Ecological benefits of minimizing fishing mortality during peak pupping seasons or having a higher degree of resolution on which to manage fisheries seasonally could be replaced by the fact that this alternative suite would implement a drastic reduction in the quota for sandbar sharks and reduced retention limits for both sandbar sharks and non-sandbar LCS. The ecological benefits of the timing of when fishing mortality occurs is secondary to the fact overall fishing mortality and effort for sharks is expected to decrease significantly.

4.2.6 Regions

This alternative suite would implement one region for commercial Atlantic shark fisheries. The ecological impacts are expected to be neutral. The regions were implemented in 2004 to address regional differences in fisheries, seasonal variation in shark pupping, and to provide fishing opportunities for regions that do not have sharks present throughout the year. Given the reduction in quotas and retention limits under this alternative suite, spreading the available quota amongst regions could result in shorter seasons and derby-style fishing; derby-style fishing could be worse for releasing bycatch alive. In addition, having one region and season simplifies quota monitoring and would relieve confusion, especially around bordering

regions, between fishermen and dealers in different regions regarding when dealers can accept shark products. Under the status quo, dealers cannot accept shark products after a region has closed for a given season, even if the sharks were caught in another region that was open at the same time. Under alternative suite 2, the shark fishing season would close everywhere at the same time, simplifying this entire process. Therefore, managing the fishery based on one region given the reduced quotas is not expected to result in negative ecological impacts for Atlantic sharks, protected resources, or other bycatch.

4.2.7 Recreational Measures

This suite would restrict the species of Atlantic sharks that could be possessed by anglers in possession of a HMS Charter/Headboat permit, HMS Angling permit, or Atlantic Tuna General Category permit (if participating in a registered HMS tournament). The Agency is attempting to restrict landings of sharks to those species that are relatively simple to identify. Restricting the shark species that could be retained by recreational anglers could result in positive ecological impacts. Tables 3.22 to 3.26 describe recreational landings of sharks by species from 1998 to 2004. SCS comprise the majority of recreationally landed sharks (by number), followed by LCS, and pelagic sharks. The only shark species that these permit holders would be authorized to possess under this alternative suite include: bonnethead, nurse, tiger, great hammerhead, smooth hammerhead, scalloped hammerhead, lemon, Atlantic sharpnose, shortfin mako, common thresher, oceanic whitetip, and blue sharks (Table 4.8). These sharks are easier to identify than other shark species and are less likely to be confused with dusky or sandbar sharks.

Table 4.8 List of recreational sharks that could be harvested under the different alternatives suites.

Species Currently Authorized to be Harvested in Recreational Fisheries (25) <i>Italicized species would no longer be authorized for retention</i>	Species Authorized to be Harvested in Recreational Fisheries as Stated in Alternative Suites 2-4 (18)
<p>LCS: <i>sandbar, blacktip, bull</i>, smooth hammerhead, scalloped hammerhead, great hammerhead, <i>silky</i>, spinner, nurse, lemon, and tiger</p> <p>SCS: <i>finetooth</i>, Atlantic sharpnose, <i>blacknose</i>, and bonnethead</p> <p>Pelagics: shortfin mako, blue, oceanic whitetip, and <i>porbeagle</i></p>	<p>No retention of sandbar sharks</p> <p>Non-sandbar LCS: smooth hammerhead, scalloped hammerhead, great hammerhead, nurse, lemon, and tiger</p> <p>SCS: Atlantic sharpnose, and bonnethead</p> <p>Pelagics: shortfin mako, blue, and oceanic whitetip</p>

Species that were previously authorized, but would no longer be allowed to be possessed in recreational fisheries include: sandbar, bull, blacktip, porbeagle, blacknose, and finetooth sharks. Average landings of sandbar, bull, blacktip, porbeagle, silky, and finetooth sharks from 2002 to 2004 were 5,784, 3,374, 36,625, 0, 3,374, 1,426, and 1,765, respectively. Ecological benefits of no longer allowing these species to be landed are variable depending upon the species. The Agency is most concerned about recreational anglers landing sandbar and dusky sharks. This action would reduce the likelihood that these sharks could be mistakenly identified and then landed. Between 2002 to 2004, there were 5,784 sharks per year of sandbar sharks landed in recreational fisheries per year. Considering the stock status of sandbar sharks,

ecological impacts would likely be positive as it would reduce the number of sandbar sharks landed and/or confused with species that look similar. Ecological impacts of prohibiting sandbar sharks would likely be positive for dusky sharks as well because they are frequently mistaken for sandbar sharks. Silky sharks are easily confused with dusky sharks; therefore, prohibiting the retention of silky sharks could result in fewer dusky sharks landed. In addition, NMFS is prohibiting the recreational landing of blacknose sharks depending on the results of the latest SCS assessment. Preliminary results from the SCS Assessment Workshop indicate that this species may be overfished with overfishing occurring. Despite the fact that this alternative suite could result in positive ecological impacts, there would likely continue to be landings of sandbar sharks illegally, and/or some level of post-release mortality for fish that are caught and released. Outreach efforts to provide recreational anglers with updated regulations and tips for proper identification of shark species that are authorized to be possessed may improve compliance with these measures.

4.2.8 Ecological Impacts of Alternative Suite 2 on Protected Resources and EFH

This alternative suite would have positive impacts on protected resources, including sea turtles, marine mammals, and smalltooth sawfish as it is expected to reduce fishing effort with gillnet and BLL gear significantly. The protected resources section of alternative suite 1 and Section 3.4 discuss current interactions with protected resources in the shark BLL and gillnet fisheries. The quotas and retention limits for sandbar and non-sandbar LCS sharks would likely reduce overall fishing effort and the number and duration of trips targeting sharks with BLL and/or gillnet gear. Furthermore, soak time might also be reduced as directed permit holders would know that they would only be allowed to possess 8 sandbar sharks per vessel per trip. Fishing effort would decrease the most in the BLL fishery as this gear is most effective for targeting sandbar and most non-sandbar LCS species. Fishing effort in the gillnet fishery would likely decrease less as this fishery mainly targets small coastal sharks and blacktip sharks. There is the possibility that some of the current fishing effort in the BLL fishery would transfer to the gillnet fishery to target species that have more liberal retention limits (*i.e.*, SCS and blacktip sharks). Furthermore, this alternative suite would limit the participants in the shark fishery to only those who possess a directed shark permit. This would reduce the number of trips setting gillnet or longline gear for sharks, and in turn, reduce the likelihood of an interaction with any protected resources. It is difficult to predict how overall fishing effort in longline and gillnet fisheries would change as a result of this alternative suite.

Ecological impacts to EFH would likely be positive as a result of this alternative suite compared to the status quo given the reduction in BLL effort as a result of reduced shark quotas. BLL gear is generally regarded as the HMS gear type most likely to potentially impact EFH of HMS and/or non-HMS. BLL gear may have some negative impact if gear is set in more complex habitats, such as hard bottom or coral reefs in the Caribbean or areas with gorgonians, or soft corals and sponges in the Gulf of Mexico (Barnette, 2001, NREFHSC, 2002; Morgan and Chuenpagdee, 2003). BLL gear set with cable groundline or heavy monofilament with weights could damage hard or soft corals and potentially become entangled in coral reefs upon retrieval, resulting in coral breakage due to line entanglement. However, the extent to which BLL gear is fished in areas with coral reef habitat targeting sharks has not been determined.

This alternative suite would reduce the number of sets with BLL gear targeting sharks because retention limits for sandbar sharks and non-sandbar LCS would be much less than current retention limits. Furthermore, fishermen might also minimize their soak time or shorten the length of longline they deploy, knowing they could only possess eight sandbar sharks and 21 non-sandbar LCS/trip.

Social and Economic Impacts

4.2.9 Species Complexes

Sandbar sharks

Placing sandbar sharks in their own management category should have neutral economic and social impacts for fishermen. Establishing a separate category for sandbar sharks from the LCS complex is mainly administrative in nature and would affect how the Agency monitors the sandbar shark quota. The establishment of a separate sandbar category would not impact fishermen, as they already record shark interactions to the species level in their logbooks. However, the economic and social impacts of reducing the sandbar quota and retention limits would have significant economic impacts and are discussed in the next section.

Non-sandbar LCS

Establishing a non-sandbar LCS complex should also have neutral economic and social impacts on shark fishermen. The non-sandbar LCS complex is similar to how the LCS complex has been managed in the past. The new complex would be established to help avoid confusion with the past LCS complex. In addition, while the Agency has managed sharks on a complex basis, fishermen have recorded shark interactions on a species basis in the logbooks, so there should be no negative impacts to fishermen by the restructuring of the LCS complex. However, the non-sandbar LCS quota reduction could have negative economic and social impacts. These impacts are discussed in the next section in combination with retention limits.

Porbeagle Sharks

Placing porbeagle sharks on the prohibited list for commercial and recreational fishing would result in no commercial or recreational landings of this species. This would have neutral economic and social impacts. This species is not targeted by U.S. fishermen, and is predominately caught, and discarded alive, in the U.S. swordfish and tuna PLL fishery. In addition, most recreational fishermen target mako, blue, and threshers sharks from the pelagic management unit (Table 3.24), therefore catch and release of porbeagle sharks is not expected to have much, if any, negative economic and social impacts on recreational fishermen. Porbeagle sharks are usually caught in the Northeast Distant area by commercial fishermen and a few recreational catches have been reported from Maine through Virginia (Table 3.26); therefore, fishermen in the North Atlantic would be affected the most by placing porbeagle sharks on the prohibited species list. A more detailed analysis of the economic impacts of establishing a 0 mt dw commercial porbeagle shark quota is discussed in the next section under quota and retention limits.

4.2.10 Quotas and Retention Limits

Alternative suite 2 would only allow sharks to be retained by shark directed permit holders. As of 2007, there were 220 shark directed, 285 shark incidental, 336 shark dealers permit holders. 143 vessels with directed shark permits and 155 vessels with shark incidental permits reported landings in the Coastal Fisheries Logbook from 2003 to 2005 and could be considered active. In addition, shark dealers could also be negatively impacted due to the reduction in the sandbar and other LCS quotas and retention limits, which would reduce the overall amount of sharks being landed.

Alternative suite 2 would also maintain the 60 mt ww (43.2 mt dw) shark display and research quota. However, 2 mt dw would be allocated specifically for sandbar sharks, the remaining 41.2 mt dw would be allocated for all species besides sandbars, and dusky sharks would not be allowed to be collected for display. This is expected to have minimal impacts on collectors of sharks for public display and shark researchers. On average, 2 mt dw of sandbar sharks per year have been collected under the exempted research program from 2000 to 2006. Therefore, there would not be an appreciable decrease in sandbar allocation compared to what was collected in past years. Thus, minimal negative economic impacts are anticipated. Ninety-four dusky sharks have been collected under the exempted fishing program from 2000 to 2006 (or 13 dusky sharks per year). Due to the prohibition of dusky shark collection under alternative suite 2 for public display, this could have a negative economic impact on a few collectors, although the majority of dusky shark collections have been for shark research under EFPs. Collectors and researchers would still have the majority of the shark display and research quota (41.2 mt dw or 57.2 mt ww) available for all non-sandbar LCS beside dusky sharks.

Fishery level impacts

Of all Atlantic HMS, sharks bring in the lowest total gross revenues (in total ~\$4.3 million in 2005; Table 3.43). On average, total annual sandbar landings of 1,590,917 lb dw and total annual non-sandbar LCS landings of 1,250,638 lb dw were reported from 2003 to 2005 in the Coastal Fisheries and HMS Logbooks. In 2006 ex-vessel prices, this is equivalent to \$3,824,589 (Table 4.9). Under this alternative suite, the commercial quotas would be reduced to 116.6 mt dw and 541.2 mt dw for non-sandbar LCS; however, to balance discards of sandbar sharks in the South Atlantic with uncaught sandbar quota in the Gulf of Mexico, the non-sandbar LCS retention limit was lowered such that only 86.1 mt dw of sandbar sharks and 253.6 of non-sandbar LCS could be landed under alternative 2 (see discussion in Appendix A under “*Non-sandbar quota and retention limits*” and Table 4.2). In 2006 prices, assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight, this is equivalent to \$1,026,032 (Table 4.9). This is a 73-percent reduction compared to the current gross revenues under alternative suite 1 (\$3,824,589; Table 4.9).

On average, 1.5 mt dw (3,402 lb dw) of porbeagle sharks were commercially landed between 2002 and 2004 (NMFS, 2006). Based on 2006 ex-vessel prices, this is equivalent to \$6,081 fishery-wide (assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight) (Table 4.9). However, since porbeagle sharks would be placed on the prohibited list under alternative suite 2, there would an estimated reduction in gross revenues of \$6,081 to the fishery by prohibiting porbeagle shark landings.

Table 4.9 Gross revenues under alternative suite 1, status quo. Fin weight was estimated to be 5 percent of total landings. Carcass weight was estimated to be 95 percent of total landings.

Alternative Suite 1	Landings (lb dw)	2006 Ex-Vessel Price (per lb dw)	Gross Revenues	Total Gross Revenues
<i>Fishery-Wide (directed and incidental permit holders)</i>				
Avg. sandbar shark landings	1,590,917			
Avg. non-sandbar LCS landings	1,250,638			
Sandbar shark fins	79,546	\$18.84	\$1,498,644	
Sandbar shark carcass	1,511,371	\$0.39	\$589,435	
				\$2,088,079
Non-sandbar LCS fins	62,532	\$18.84	\$1,178,101	
Non-sandbar LCS carcass	1,188,106	\$0.47	\$558,410	
				\$1,736,511
Total shark fishery				\$3,824,589
Avg. porbeagle shark landings	3,402			
Porbeagle shark fins	170.1	\$18.84	\$3,205	
Porbeagle shark carcass	3,232	\$0.89	\$2,876	
				\$6,081
<i>Directed Permit Holders</i>				
Avg. sandbar shark landings	1,571,851			
Avg. non-sandbar LCS landings	1,210,643			
Sandbar shark fins	78,593	\$18.84	\$1,480,684	
Sandbar shark carcass	1,493,258	\$0.39	\$582,371	
				\$2,063,054
Non-sandbar LCS fins	60,532	\$18.84	\$1,140,425	
Non-sandbar LCS carcass	1,150,111	\$0.47	\$540,552	
				\$1,680,977
Total revenues from sharks based on directed permit holders' landings				\$3,744,032
<i>Incidental Permit Holders</i>				
Avg. sandbar shark landings	19,066			
Avg. non-sandbar LCS landings	39,995			
Sandbar shark fins	953	\$18.84	\$17,960	
Sandbar shark carcass	18,113	\$0.39	\$7,064	
				\$25,024
Non-sandbar LCS fins	2,000	\$18.84	\$37,675	
Non-sandbar LCS carcass	37,995	\$0.47	\$17,858	
				\$55,533
Total revenues from sharks based on incidental permit holders' landings				\$80,558

In alternative suite 2, overharvests of quota for each category would be removed from the next season's quota. This is currently done under the status quo; therefore, it is not anticipated to

result in any more negative economic impacts than what fishermen currently experience under the status quo regulations. Underharvests for species that are not overfished or are not experiencing overfishing would be capped at 50 percent carryover of the base quota applied to the next season's quota. If the underharvest exceeds 50 percent of the baseline quota, then only 50 percent of the baseline quota could be carried over to the same season of the subsequent year. Currently, all of the underharvest for a given complex has been applied to the next year, same trimester's base quota. This has been most significant for small coastal sharks (SCS), which, on average from 2004 through the first season of 2006, had only had 55 percent of the SCS quota filled. Since nearly full harvests or overharvests have typically occurred for the LCS complex, application of underharvest to LCS base quota to future seasons has not been an issue. The economic impact of reducing the amount of underharvest that could be carried over would depend on the amount of the underharvest, but would most likely have the largest economic effects for SCS. In addition, since there would be no regions or seasons under alternative suite 2, the amount of SCS underharvests expected from a full year of fishing in all regions is unknown at this time.

However, unlike the status quo, underharvests for species that are unknown, overfished, or experiencing overfishing would not be carried over to the same season of the following year. This could have a negative economic impact depending on the quota. For instance, the overfished/overfishing status of sandbar sharks and the unknown status of the LCS complex would preclude any underharvest of the sandbar or non-sandbar LCS quota from being applied to the following season's base quota. However, given the reduced sandbar quota and since the non-sandbar LCS quota is based on current catches of LCS species (except sandbar sharks), underharvests of sandbar sharks or non-sandbar LCS are not anticipated. Therefore, this may not result in negative socioeconomic impacts. In addition, underharvest carry-overs are currently not applied for pelagic sharks. Since the status of all pelagic sharks are either unknown or overfished, this would not change compared to the status quo.

Finally, alternative suite 2 would require that all shark fins (dorsal, second dorsal, pectoral, pelvic, anal, and caudal fins) remain attached to the shark through landing. In the short-term, this alternative could change the foundation of the U.S. Atlantic shark fin market. At this time and since the fishery began in the 1980s, most shark fins sold in the United States are landed separately from the shark. In 1993, shark fins were required to be removed from the vessel at the first port of landing. This prevented fishermen from drying shark fins onboard their vessel over time in order to increase the value of the fin. Under alternative suite 2, shark fishermen would not be allowed to remove the fins from the shark until sharks are landed. Costa Rica has implemented a similar regulation that allows fishermen to cut the fins mostly off the shark, as long as a small piece of skin keeps the fins attached to the shark until landing. According to a discussion on the Elasmobranch listserve, this practice has allowed fishermen to receive the expected revenues from both fins and meat because the fins could be fully removed from the shark at the dock without thawing the shark. However, the removal of fins at the time of offloading could still increase offloading time. The vessel owner/operator would need to decide whether the benefit of selling the fins separately from the shark outweighs the cost of having the crew remove the fins during offloading. While the fins would likely still be of high quality once dried, it is possible that the ex-vessel price of fins packed in ice with the rest of the shark would not be as high as fins that had begun drying. Additionally, if the shark cannot be

packed in ice properly due to maintaining the fins on the shark, the quality of the meat, and therefore its value, could also decrease. The social impact of requiring sharks to be landed with their fins on may be realized as the market adjusts itself to processing wet fins. However, the overall socioeconomic impact of this measure could be significant given the reductions in the overall sandbar quota, which is the most lucrative shark due to the value of its fins.

Directed permit holder impacts

On average, directed permit holders landed 1,571,851 lb dw of sandbar sharks and 1,210,643 of non-sandbar LCS from 2003 to 2005 based on data from the Coastal Fisheries and HMS Logbooks. In 2006 ex-vessel prices, this is equivalent to gross revenues of \$3,744,032 (assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight) (Table 4.9). If gross revenues for directed permit holders are averaged across the approximately 143 active directed shark permit holders, then the average annual gross revenues per shark fishing vessel is just over \$26,000 from shark revenues. Under alternative suite 2, average annual gross revenues for directed permit holders would be estimated to be \$1,026,032 (Table 4.10). This is a 73-percent overall reduction in average annual gross revenues compared to 2003 to 2005 (Table 4.10). These reduced gross revenues averaged across the 143 active directed permit holders are just over \$7,000 per directed shark fishing vessel. Since the states of Florida, New Jersey, and North Carolina have the most directed shark permits (Table 3.32), these states would be most negatively impacted by alternative suite 2.

Table 4.10 Gross revenues under alternative suite 2. Fin weight was estimated to be 5 percent of total quota. Carcass weight was estimated to be 95 percent of total quota.

Alternative Suite 2	Quota (mt dw)	Quota (lb dw)	2006 Ex-Vessel Price (per lb dw)	Gross Revenues	Total Gross Revenue	% Reduction from Status Quo
<i>Fishery-Wide & Directed Permit Holder Impacts</i>						
Sandbar shark	86.1	189,816				
Non-sandbar LCS	253.6	559,087				
Sandbar shark fins		9,480	\$18.84	\$178,599		
Sandbar shark carcass		180,336	\$0.39	\$70,331		
					\$248,930	
Non-sandbar LCS fins		27,998	\$18.84	\$527,490		
Non-sandbar LCS carcass		531,088	\$0.47	\$249,611		
					\$777,102	
Total revenues from sandbar and non-sandbar LCS landings					\$1,026,032	↓73%
Status quo revenues based on directed & incidental permit holders' landings of sandbar and non-sandbar LCS					\$3,824,589	

In addition, retention of sandbar sharks on PLL gear would be prohibited under alternative suite 2. On average, 80,825 lb dw of sandbar sharks were reported landed on PLL

gear by directed shark permit holders from 2003 to 2005 (HMS Logbook). In 2006 ex-vessel prices, this is equivalent to \$106,802 in gross revenues. Given an average of 16.7 vessels landed sandbar sharks with PLL gear from 2003 to 2005, prohibition of sandbar sharks on PLL gear could result in a loss of gross revenues of \$6,395 per vessel ($\$106,802 / 16.7 \text{ vessels} = \$6,395$ per vessel).

Gross revenues under the status quo were based on a 4,000 lb dw LCS trip limit for directed shark permit holders. These revenues were estimated from landings using all gear types, averaged across all regions. Given this, the average number of sandbars and non-sandbar LCS landed per trip was 35 sandbars and 32 non-sandbar LCS averaged as reported in the Coastal Fisheries and HMS Logbooks. Based on 2006 ex-vessel prices, this is equivalent to \$3,358 per trip (Table 4.11). However, regional gross revenues may vary based on gear type and catch composition. For instance, regional trip revenue estimates were made based on species catch composition from the BLL observer program data (Hale and Carlson, 2007). These estimates were made because BLL trips targeting sharks can have very different species catch compositions than gillnet or rod and reel trips, and the species catch composition may also vary from region to region. Therefore, gross revenues and economic impact to fishermen may vary, depending on the gear type employed and area fished. Observer data indicate that between 2005 and 2006, 69 sandbar sharks and 35 non-sandbar LCS were caught per trip in the South Atlantic region, and 30 sandbar sharks and 83 non-sandbar LCS were caught per trip in the Gulf of Mexico region (Hale and Carlson, 2007). Therefore, based on these numbers and 2006 ex-vessel prices, South Atlantic trips averaged \$4,743 per trip and Gulf of Mexico trips averaged \$5,853 per trip (Table 4.11) (whereas the overall averaged gross revenues for directed shark permit holders was estimated as \$3,358 per trip; Table 4.11).

Table 4.11 Gross revenues on a trip basis in the South Atlantic (SA) and Gulf of Mexico (GOM) under alternative suite 1, status quo.

Alternative Suite 1	Average Number of Sandbars	Average Number of Trips	Landings (lb dw)*	Fin Weight (5% of landings per trip)	Fin 2006 Ex-Vessel Price (lb dw)	Fin Revenues Per Trip	Carcass Weight (95% of landings per trip)	Carcass 2006 Ex-Vessel Price (lb dw)	Carcass Revenues Per Trip	Total Gross Revenues Per Trip
<i>Trips by Directed Permit Holders</i>										
Avg. sandbar sharks per trip	35	1,108	1,416	71	\$18.84	\$1,335	1,347	\$0.39	\$525	\$1,860
Avg. non-sandbar LCS per trip	32	1,108	1,078	54	\$18.84	\$1,016	1,024	\$0.47	\$482	\$1,497
Trip total revenues from sharks										\$3,358
<i>Trips by Incidental Permit Holders</i>										
Avg. sandbar sharks per trip	2	305	81	4	\$18.84	\$77	77	\$0.39	\$30	\$107
Avg. non-sandbar LCS per trip	3	347	101	5	\$18.84	\$96	96	\$0.47	\$45	\$141
Trip total revenues from sharks										\$248
<i>Regionally based BLL trips (Directed Permit Holders)</i>										
Avg. sandbar sharks per trip in SA	69		2,795	140	\$16.20	\$2,264	2,655	\$0.38	\$1,009	\$3,272
Avg. sandbar sharks per trip in GOM	30		1,215	61	\$20.65	\$1,255	1,154	\$0.40	\$462	\$1,716
Avg. non-sandbar LCS per trip in SA	35		1,180	59	\$16.20	\$955	1,121	\$0.46	\$515	\$1,471
Avg. non-sandbar LCS per trip in GOM	83		2,797	140	\$20.65	\$2,888	2,657	\$0.47	\$1,249	\$4,137
Total SA trip revenues from sharks										\$4,743

Alternative Suite 1	Average Number of Sandbars	Average Number of Trips	Landings (lb dw)*	Fin Weight (5% of landings per trip)	Fin 2006 Ex-Vessel Price (lb dw)	Fin Revenues Per Trip	Carcass Weight (95% of landings per trip)	Carcass 2006 Ex-Vessel Price (lb dw)	Carcass Revenues Per Trip	Total Gross Revenues Per Trip
Total GOM trip revenues from sharks										\$5,853

*Average sandbar shark weight = 40.5 lb dw and average non-sandbar LCS weight = 33.7 lb dw (Cortes and Neer, 2005).

Under alternative suite 2, the retention limits are 8 sandbars per trip and 21 non-sandbar LCS per trip. Non-sandbar LCS retention limits are based on the average ratio of sandbars to non-sandbar LCS caught in the South Atlantic and Gulf of Mexico regions to limit sandbar shark discards by fishermen deploying non-selective gear (Hale and Carlson, 2007). In the Gulf of Mexico, the ratio of sandbars to other LCS caught is 1:4 which, based on an 8 sandbar per trip retention limit, would equal 32 non-sandbar LCS per trip. However, such a high non-sandbar LCS retention limit would result in a sandbar discards in the South Atlantic (~65.3 mt dw). Therefore, a 21 non-sandbar LCS per trip retention limit was set to balance discards versus catch in the two regions (see Table A.4). This results in approximately 5 sandbar sharks being caught in the Gulf of Mexico region when the non-sandbar LCS retention limit per trip is filled (and therefore, only 86.1 mt dw of sandbar sharks would be landed). Therefore, gross revenues on a trip basis are estimated to be \$1,262 of gross revenue per trip in the South Atlantic and \$1,333 of gross revenue per trip in the Gulf of Mexico (Table 4.12). Thus, alternative suite 2 could result in a 73-percent reduction in gross revenues for fishermen using BLL gear in the South Atlantic and a 77-percent reduction in gross revenues for fishermen using BLL gear in the Gulf of Mexico. Overall, from 2003 to 2005, there were 124 vessels that averaged more than 324 lb dw (or 8 sandbar sharks) of sandbar per trip (Figure A.3). It is estimated that these vessels would be most negatively affected by retention limits under alternative suite 2.

Table 4.12 Gross revenues on a trip basis in the South Atlantic (SA) and Gulf of Mexico (GOM) under alternative suite 2.

Alternative Suite 2	Number of sandbars	Landings (lb dw)*	Fin Weight (5% of landings per trip)	Fin 2006 ex-vessel price (lb dw)	Fin Revenues	Carcass Weight (95% of landings per trip)	Carcass 2006 Ex-Vessel Price (lb dw)	Carcass Revenues	Total Gross Revenues
<i>Regionally based BLL trips</i>									
Total sandbar sharks per trip in SA	8	324	16	\$16.20	262	308	\$0.38	\$117	\$379
Total sandbar sharks per trip in GOM	5	203	10	\$20.65	209	192	\$0.40	\$77	\$286
Total non-sandbar LCS per trip in SA	21	708	35	\$16.20	573	672	\$0.46	\$309	\$883
Total non-sandbar LCS per trip in GOM	21	708	35	\$20.65	731	672	\$0.47	\$316	\$1,047
SA trip total revenues from sharks									\$1,262
GOM trip total revenues from sharks									\$1,333

*Average sandbar shark weight = 40.5 lb dw and average non-sandbar LCS weight = 33.7 lb dw (Cortes and Neer, 2005).

Incidental permit holder impacts

On average, 66 incidental permit holders landed 19,066 lb dw per year of sandbar sharks and 39,995 lb dw per year of non-sandbar LCS from 2003 to 2005 in the Coastal Fisheries and HMS Logbooks. Using 2006 ex-vessel prices, this is equivalent to gross revenues of \$80,558 (assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight) (Table 4.9). Gross revenues averaged across the 66 vessels with incidental permits landing sharks were just over \$1,221 per vessel. Since incidental permit holders would not be able to land any sharks under alternative suite 2, the 66 active vessels would be most negatively affected by this alternative suite. The states of Florida, Louisiana, New Jersey, and North Carolina had the most incidental shark permit holders as of 2007 (144, 37, 20, and 16, respectively; Table 3.32); therefore, these states would be most negatively impacted by alternative suite 2.

4.2.11 Time/Area Closures

Under alternative suite 2, NMFS would maintain the mid-Atlantic shark closed area and the current BLL closures in the Caribbean that were implemented in February 2007 (72 FR 5633). Therefore, the economic impacts associated with the closures would be the same as described under alternative suite 1.

However, under alternative suite 2, NMFS would consider implementing the SAFMC MPAs. Based on observer program data, the number of sets and targeted catch in the preferred MPAs is considered to be minimal. The preferred MPAs are generally small (< 10 miles wide) and vessels should be able to make minor adjustments to fishing locations to avoid the MPAs. Most of the observed shark BLL sets occurred shoreward of the MPAs. Affected vessels would forego some loss of revenue from the reduced bycatch of grouper and other species caught on shark BLL sets in the proposed MPAs, however, these losses are expected to be minimal. Based on the expanded catch estimates (Siegfried et al. 2006b), the total shark catches for the proposed MPAs were 25,395 and this equates to approximately \$1,060,083 in gross revenues on shark landings based on 2006 ex-vessel prices for shark (assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight) (Table 3.41 in Chapter 3). However, this may be an overestimate if all the catches did not occur in the MPAs. Since there are approximately 285 number of shark limited access permits in Florida, this would amount to a loss of revenue of approximately \$3,722 per vessel per year in Florida.

4.2.12 Reporting

Reporting burden would be increased significantly for Atlantic shark dealers as a result of this alternative suite resulting in negative economic impacts. Currently, shark dealer reports must be submitted bimonthly, regardless of whether or not the dealer actually purchased any shark products. Reporting frequency would be increased to 24 hours of when shark products were purchased. Thus, dealer landings reports would need to be received within 24 hours of the product being purchased. While the increased reporting burden would not impact shark dealer expenditures per se, it would result in more time spent submitting dealer reports, which represents an opportunity cost for dealers since that would be time they could not spend conducting other activities related to their business. Furthermore, in order to comply with the

requirement that dealer reports must be *received* by the Agency within 24 hours, it is assumed that dealers would have to submit dealer reports electronically or via facsimile. Dealers that do not currently possess a computer or fax machine would have to purchase one of these items. The increased reporting burden implemented in this alternative suite would be subject to approval under the Paperwork Reduction Act. Reporting requirements for shark vessel permit holders, including the need to take an observer if selected and the need to submit vessel logbooks within seven days of completing a fishing trip would not be modified, resulting in neutral economic impacts.

Alternative suites 2 through 4 would modify the procedure for accounting for sharks that are reported by dealers as unclassified or unidentified. Currently, these sharks are counted against the LCS quota. This would be modified such that these sharks would be classified as sandbar sharks. As a result of the proposed measures, sandbar sharks would have the lowest commercial quota. However, sandbar sharks have the highest commercial value of any Atlantic shark because of their fin. This requirement will improve the accuracy of dealer reports and number of dealer reports that include species-specific information on all sharks that are purchased. These data form the basis of quota monitoring and stock assessments. Furthermore, if shark dealers are provided with an incentive to mis-identify the species of shark being purchased in order to keep the sandbar shark season open longer, this may result in overharvests. While the short-term impacts of this measure may be negative because it requires more of the dealer's time to properly identify sharks, long-term effects may be positive. Potential overharvests or inappropriately short seasons coupled with potentially inaccurate stock assessments results could occur as a result of mis-identified or unidentified landings included in dealer reports. This measure coupled with mandatory shark identification workshops for shark dealers and the proposed requirement for fishermen to leave all shark fins could improve the accuracy of shark dealer reports.

4.2.13 Seasons

Coupled with the measures included under regions (Section 4.2.5), this alternative suite would likely have negative economic impacts on vessels and dealers in the North Atlantic. Opening seasons on the effective date of this amendment in 2008 in all regions and then on January 1 in 2009 and thereafter, depending on available quota, would provide an advantage to vessels participating in shark fisheries in the South Atlantic and Gulf of Mexico regions as these regions have a wider variety of LCS and SCS sharks present year-round. Participants in the North Atlantic region could experience negative impacts relative to the status quo as they would likely not be able to fish for sharks starting January 1, unless they moved to fish in another region; historically, these participants have only had significant landings of LCS and pelagic sharks. Furthermore, closing both the sandbar and non-sandbar LCS fisheries, regardless of which quota is filled first, to minimize bycatch and dead discards of sandbar sharks could exacerbate the negative economic impacts in all regions. Landings in the North Atlantic regions have averaged 62.3 mt dw per year for LCS (including sandbar sharks) between 2004 and 2006. The majority of these LCS were landed between April and June in the North Atlantic region. Assuming that the entire quota is filled, and seasons for sandbar and non-sandbar LCS are closed before April, this could result in losses in gross revenues of approximately \$32,963 for vessels in the North Atlantic, based on 2005 ex-vessel prices (LCS = \$0.24 per lb dw in the North Atlantic; \$0.24 lb dw x 137,346.6 lb dw = \$32,963; no price information is available for fins in the North

Atlantic; Table 3.42). There are 107 directed and incidental shark permit holders in the states that comprise the North Atlantic region; therefore, losses are anticipated to be around \$308 in gross revenues per vessel (\$32,963 total gross revenues / 107 vessels = \$308 per vessel). However, depending on their past involvement in the shark fishery, economic impacts to individual vessel owners would vary.

Vessels and dealers in the South Atlantic and Gulf of Mexico regions would experience a comparative advantage over vessels in the North Atlantic, however, reduced quotas and retention limits for sandbar sharks and non-sandbar LCS sharks would result in negative economic impacts for vessels and dealers in all locales. There is a possibility that the reduced retention limits for sandbar and non-sandbar LCS sharks, coupled with the increased reporting frequency for dealers may result in minor positive economic impacts by keeping shark fishing seasons for LCS and sandbar sharks open for an extended portion of the year. In 2006, shark seasons for LCS were open a total of 4, 19, and 18 weeks in the North Atlantic, South Atlantic, and Gulf of Mexico, respectively. The first trimester was excluded from the North Atlantic calculation as landings for LCS are almost zero during these months (January – April). In 2007, shark seasons for LCS were 3, 4, and 5 weeks for the North Atlantic, South Atlantic, and Gulf of Mexico, respectively. Extensive over harvests in 2006 were responsible for short seasons in 2007. This alternative suite may result in longer shark seasons, which could have some minor economic impacts as it may provide for a longer portion of the year when vessels could land and sell shark products.

As mentioned in Section 4.2.5, the Agency anticipates that providing five days notice once 80 percent of the quota has been harvested would reduce the likelihood of an overharvest and provide a buffer for landings that may occur outside of NMFS jurisdiction after a season has closed. Further, this would implement necessary accountability measures under the Magnuson-Stevens Act. However, the Agency is seeking specific comments on the potential economic impacts of choosing 80 percent as the threshold to close a specific shark fishery with five days notice.

4.2.14 Regions

As stated in Section 4.2.4, this alternative suite would likely have negative economic impacts on regions that do not have sharks present year round. The North Atlantic region would be disadvantaged as a result of reverting back to one region, versus three, because the quota would likely be harvested in southern regions before sharks are present in the North Atlantic. Vessels could either move to southern areas to participate in the shark fishery in areas where sharks are present year-round or redistribute fishing effort to other fisheries. Dealers in the North Atlantic region would also be affected, possibly even more so than vessel owners, as the likelihood of having a consistent and predictable source of shark products would be decreased.

4.2.15 Recreational Measures

Participants in recreational shark fisheries would experience negative economic impacts as a result of reducing the species of sharks that could be legally landed (Table 4.8). Charter/Headboat operators would be most affected as a result of these measures as they may see a reduction in the number of charters that customers are willing to hire. Since retention of

blacktip sharks would be prohibited in the recreational fishery, these impacts may be most pronounced in areas where blacktip sharks are frequently encountered, including the South Atlantic and Gulf of Mexico regions. Recreational landings data indicates that there are more landings of blacktip sharks than any other species that could no longer be possessed as a result of this alternative suite. It is presumed that blacktip sharks are kept more than any other LCS because of the higher quality of their flesh and the fact that they are more abundant than other LCS in coastal waters. Charter/Headboat operators specializing in sharks may see the number of charters decline because some fishermen insist on keeping a blacktip or sandbar sharks. Prohibiting the other species (finetooth, silky, bull, blacknose, and porbeagle) is not expected to have adverse impacts as these species are not as frequently encountered in recreational fisheries for sharks.

Tournaments offering prize categories for sharks may also experience negative economic impacts as a result of prohibiting six additional species of sharks for retention in recreational fisheries. The majority of tournaments specializing in sharks are in the North Atlantic region, specifically Rhode Island, New York, and Massachusetts. In 2005 and 2006, there were 60 tournaments/year with prize categories for pelagic sharks. Species most commonly targeted in these tournaments including common thresher, oceanic whitetip, blue, shortfin mako, and porbeagle. Of these, only porbeagle would be prohibited from retention as stocks are overfished. Tournaments are generally won by shortfin mako or common thresher, therefore, significant economic impacts as a result of prohibiting porbeagle retention in shark fishing tournaments are not anticipated.

Conclusions

This alternative suite could have positive ecological impacts for most species of sharks, bycatch, and protected resources as a result of significantly reduced retention limits and quotas for sandbar sharks and reduced retention limits for non-sandbar LCS. Interactions with protected resources may decrease as a result of reduced BLL and gillnet fishing effort targeting sharks; however, it is assumed that some of this fishing effort would be displaced to other gillnet and BLL fisheries in which participants are permitted, which may interact with protected resources. In addition, alternative suite 2 would require that sharks be landed with their fins still attached; this requirement could prevent fishermen from keeping the fins from sharks that are not landed, resulting in a reduction of overall shark mortality. This, combined with a retention limit of only 8 sandbar sharks for directed permit holders, would likely considerably reduce directed fishing effort for sharks.

The shark fishery for incidental permit holders would be closed; therefore, sharks caught in pursuit of other species with BLL gear or gillnet gear by incidental permit holders would be discarded, possibly dead. This is particularly true for sandbar shark discards based on how retention limits for sandbar and non-sandbar LCS would be established (see Section 4.2.2). However, despite the possible increase in discards of sharks, the reduced fishing effort and landings could still result in positive ecological impacts for sandbar and dusky shark (see Section 4.2.2). In addition, this suite represents an increase in reporting burden for shark dealers (24 hours versus bimonthly reporting) that would result in negative economic impacts but positive ecological impacts as it would enable the Agency to better monitor shark quotas, reducing the likelihood of overharvest. Under alternative suite 2 NMFS would maintain the current time/area

closures and implement eight MPAs that are being preferred in the SAFMC's Amendment 14A. NMFS proposed these MPAs due to enforceability issues where the gears for different fisheries (*i.e.*, shark BLL gear and snapper/grouper BLL gear) are virtually indistinguishable, and many fishermen hold both types of permits. Therefore, prohibiting only one type of gear could create an enforcement loophole.

Directed shark permit holders would have a slightly higher retention limit for sandbar and non-sandbar LCS compared to alternative suites 3 and 5; however, economic benefits derived from shark products would be limited to directed permit holders and would still represent an estimated 73-percent reduction in gross revenues compared to the status quo (Table 4.10). These losses in gross revenues may be exacerbated by the requirement to land shark with their fins attached. In addition, eliminating regions and seasons represents an economic disadvantage to the North Atlantic region as sharks are not present in these waters year-round, meaning the quota may be caught in some years before sharks are present in these areas. The elimination of seasons and regions combined with limiting underharvest carry-overs may have negative economic impacts on fishermen, especially for regions that consistently had underharvests of species like SCS. Given the lowered retention limits for sandbar and non-sandbar LCS, it is anticipated that there may not be a directed shark fishery as a result of alternative suite 2. While an observer program would still operate under alternative suite 2, without a directed shark fishery, it is anticipated that the fishery dependent data collection would be limited, which could compromise data collection for future stock assessments. Alternative suite 4 would accomplish reduced quotas and retention limits to rebuild depleted shark stocks as well as the collection of fishery-dependent data for future stock assessments and biological samples for shark research. In addition, it would afford a small universe of shark fishermen to continue to fish and make gross revenues on shark landings as they have in the past. Therefore, this alternative suite is not preferred because concerns of data collection, economic impacts to shark fishermen, and because of additional reporting burden on shark dealers.

4.3 Alternative Suite 3: Shark Fishery for Directed, Incidental, HMS Angling, and HMS Charter/Headboat Permit Holders

Overall Summary

Under alternative suite 3, NMFS would remove the sandbar shark from the LCS complex and establish a separate sandbar shark quota and a non-sandbar LCS quota (LCS complex minus sandbar sharks). Overharvests would be removed from the next season's quota. Underharvests for species that are healthy or rebuilt would be transferred to the next season's quota, up to 50 percent of the base quota. For species/complexes that are unknown, overfished, or experiencing overfishing, underharvests would not be transferred to the next season's quota. Quotas would be as follows: Sandbar = 116.6 mt dw; non-sandbar LCS = 541.2 mt dw; SCS = 454 mt dw; Blue Sharks = 273 mt dw; Pelagic Sharks (Other than Blue Sharks) = 488 mt dw; Porbeagle Sharks = Prohibited (0 mt dw quota); and Display and Scientific Research = 60 mt ww (Sandbar = 2.8 mt ww (2 mt dw); and all other shark species (except dusky sharks) = 57.2 mt ww (41.2 mt dw).

The existing BLL and PLL time/area closures, including the Caribbean BLL closures for EFH, would remain in place. In addition, NMFS would implement the 8 MPAs off South Carolina to Florida as requested by the SAFMC. Retention limits would be as follows: 4 sandbar

per vessel per trip and 10 non-sandbar LCS per vessel per trip for directed and incidental permit holders; no retention limit for SCS and pelagic sharks (except porbeagle sharks) for directed permit holders; 16 SCS and pelagic sharks (except porbeagle sharks) combined for incidental permit holders; no retention of porbeagle sharks by commercial or recreational fishermen; and all sharks landed with fins attached.

Dealer reports must be received by NMFS within 14 days, and logbook and observer requirements would be maintained. In addition, all unclassified sharks reported would be categorized as sandbar sharks. There would be one season starting on January 1 of each year and one region. The sandbar and non-sandbar LCS fishery would close when landings of either reach 80 percent of the available quota with a five day notice, and SCS and pelagic shark fisheries would close when SCS and pelagic shark landings reach 80 percent of their respective quotas. Finally, recreational fishermen could land bonnethead, nurse, tiger, lemon, hammerheads, Atlantic sharpnose, shortfin mako, common thresher, oceanic whitetip, and blue sharks. The recreational possession limit would be 1 shark > 54" per vessel per trip, and 1 Atlantic sharpnose and 1 bonnethead per person per trip with no minimum size requirements.

Ecological Impacts

4.3.1 Quotas/Species Complexes

As with alternative suite 2, overharvests of quota for each category would be removed from the next season's quota. Underharvests for species that are not overfished or are not experiencing overfishing would be capped at 50 percent carryover of the base quota applied to the next season's quota. However, underharvests for species that are unknown, overfished, or experiencing overfishing would not be carried over to the next season's quota. This is anticipated to have positive ecological impacts for species that are not overfished and no overfishing is occurring by preventing stockpiling of quota. This would also have positive ecological impacts for species that are unknown, overfished, or experiencing overfishing by allowing these stocks to rebuild at a faster rate.

Species complexes

Under alternative suite 3, NMFS would structure quotas and species complexes as they are outlined for alternative suite 2. Therefore, the ecological impacts associated with the species complexes would be the same as described in alternative suite 2. A more detailed analysis of the ecological impacts of the quotas under alternative suite 3 is outlined in the next section under retention limits.

Exempted fishing program

Finally, as with alternative suite 2, alternative suite 3 would partition the 60 mt ww (43.2 mt dw) quota for exempted fishing permits, display permits, scientific research permits, and letters of acknowledgement to place more stringent limits on the quantity of sandbar and dusky sharks authorized for these purposes. Therefore, the ecological impacts of the 60 mt ww quota for exempted fishing permits would have the same ecological impacts as outlined under alternative suite 2.

4.3.2 Retention Limits

Fishery-wide landings

As with alternative suite 2, alternative suite 3 would require that shark fins remain attached to the shark until the first port of landing. The fins could be removed either by the fisherman or the dealer after landing. The shark could still be headed, gutted, and bled while at sea. To ensure the sharks are stored in a manner that would maximize the value and quality of the sharks, the fins could be sliced as long as they are not removed completely from the shark (*i.e.*, they could remain attached to the shark via a small amount of uncut skin). This would result in less of a chance of misidentifying the shark or the fins, which would help with species-specific reporting by fishermen and dealers and improve data for future stock assessments. Additionally, because fishermen would no longer be able to bypass the regulations by keeping the fins of shark that are not landed, fishing mortality of sharks overall could be reduced. This would help with the rebuilding of overfished species of sharks, such as sandbar sharks.

Overall commercial quotas under alternative suite 3 would be reduced to 116.6 mt dw and 541.2 mt dw for sandbar and non-sandbar LCS (see Appendix A and Tables A.1 and A.3). However, to balance discards of sandbar sharks in the South Atlantic with uncaught sandbar quota in the Gulf of Mexico, the non-sandbar LCS retention limit was lowered such that only 105.9 mt dw of sandbar sharks and 229.2 mt dw of non-sandbar LCS would potentially be landed under alternative suite 3 (see discussion below and in Appendix A under “*Non-sandbar quota and retention limits*” and Tables A.4 and Table 4.2). These landings (105.9 mt dw of sandbar sharks and 229.2 mt dw non-sandbar LCS; Table 4.13) would be spread out over directed and incidental permit holders’ past effort or a total of 1,143 trips (Table A.2). Based on this past effort, it was assumed 1,108 trips would be made by directed permit holders (see Table A.2; 790 trips+80 trips+237.7 trips = 1,108 trips). This directed fishing effort of 1,108 trips is 78 percent of the total expected fishing effort (*i.e.*, 1,108 trips / 1,143 trips = 78 percent; Table 4.14). Based on this estimated effort, it is anticipated that approximately 83 mt dw (183,073 lb dw) of sandbar sharks (78 percent x 105.9 mt dw = 83 mt dw) and 180 mt dw (396,225 lb dw) of the non-sandbar LCS (78 percent x 229.2 mt dw = 180 mt dw) would be landed by directed permit holders (Table 4.2 and Table 4.14). Based on the status quo, this is an 88-percent reduction in sandbar landings and a 67-percent reduction in non-sandbar LCS landings for directed permit holders (Table 4.9).

Similarly, based on past effort, it was assumed 305 trips could be made by incidental permit holders (see Table A.2; 49.7 trips + 255.3 trips = 305 trips). This is 22 percent of the expected fishing effort (305 trips / 1,413 trips = 22 percent; Table A.2 and Table 4.14). Based on this estimate effort, it is anticipated that approximately 23 mt dw (50,395 lb dw) of sandbar sharks (22 percent x 105.9 mt dw = 23 mt dw) and 50 mt dw (109,069 lb dw) of the non-sandbar LCS (22 percent x 229.2 mt dw = 50 mt dw) would be landed by incidental permit holders (Table 4.2 and Table 4.14). This equates to almost three times more landings of sandbar sharks and non-sandbar LCS for incidental permit holders than what is landed under the status quo (Table 4.2). Despite this increase for incidental permit holder, total sandbar landings of 105.9 mt dw would be an 85-percent reduction in landings for sandbar sharks fishery-wide compared to the status quo (Table 4.2). Total 229.2 mt dw non-sandbar LCS landings would be a 61-percent

reduction in landings for non-sandbar LCS fishery-wide compared to the status quo (see Table 4.2).

Table 4.13 Gross revenues under alternative suite 3. Fin weight was estimated to be 5 percent of total quota. Carcass weight was estimated to be 95 percent of total quota.

Alternative Suite 3	Quota (mt dw)	Quota (lb dw)	2006 ex- vessel price (per lb dw)	Gross Revenues	Total Gross Revenue	% Reduction from Status Quo
<i>Fishery-Wide Impacts</i>						
Sandbar shark	105.9	233,467				
Non-sandbar LCS	229.2	505,294				
Sandbar shark fins		11,673	\$18.84	\$219,926		
Sandbar shark carcass		221,794	\$0.39	\$86,500		
					\$306,426	
Non-sandbar LCS fins		25,265	\$18.84	\$475,987		
Non-sandbar LCS carcass		480,030	\$0.47	\$225,614		
					\$701,601	
Total revenues from sandbar and non-sandbar LCS landings					\$1,008,027	↓74%
Status quo revenues based on directed & incidental permit holders' landings of sandbar and non-sandbar LCS					\$3,824,589	

Table 4.14 Gross revenues for directed and incidental permit holders under alternative suite 3.

Alternative Suite 3	Predicted # of Trips	Trip Limit	Quota (lb dw)	Total Trips (directed and incidental permit holder trips)	% of Fishing Effort	Amount of Quota (lb dw) (Quota x % of Fishing Effort)	Fin Weight (5% of landings per trip)	Fin 2006 ex-vessel price (lb dw)	Fin Revenues	Carcass Weight (95% of landings per trip)	Carcass 2006 ex-vessel price (lb dw)	Carcass Revenues	Total Gross Revenues
<i>Impacts On Directed Permit Holders</i>													
Sandbar sharks	1,108	4	233,467	1,143	78%	183,073 (83 mt dw)	9,154	\$18.94	\$173,370	173,919	\$0.39	\$67,828	\$241,198
Non-sandbar LCS	1,108	10	505,294	1,143	78%	396,225 (180 mt dw)	19,811	\$18.94	\$375,225	376,414	\$0.47	\$176,915	\$552,140
Total revenues from sandbar and non-sandbar LCS landings													\$793,338
Status quo revenues based on directed permit holders' landings of sandbar and non-sandbar LCS													\$3,744,032
<i>Impacts On Incidental Permit Holders</i>													
Sandbar sharks	305	4	233,467	1,413	22%	50,395 (23 mt dw)	2,520	\$18.94	\$47,724	47,875	\$0.39	\$18,671	\$66,395
Non-sandbar LCS	305	10	505,294	1,413	22%	109,069 (50 mt dw)	5,453	\$18.94	\$103,289	103,616	\$0.47	\$48,699	\$151,988

Alternative Suite 3	Predicted # of Trips	Trip Limit	Quota (lb dw)	Total Trips (directed and incidental permit holder trips)	% of Fishing Effort	Amount of Quota (lb dw) (Quota x % of Fishing Effort)	Fin Weight (5% of landings per trip)	Fin 2006 ex-vessel price (lb dw)	Fin Revenues	Carcass Weight (95% of landings per trip)	Carcass 2006 ex-vessel price (lb dw)	Carcass Revenues	Total Gross Revenues
Total revenues from sandbar and non-sandbar LCS landings													\$218,383
Status quo revenues based on incidental permit holders' landings of sandbar and non-sandbar LCS													\$80,558

Landings on a trip basis

The retention limits for alternative suite 3 would be 4 sandbar sharks per vessel per trip (compared to 8 under alternative suite 2) and 10 non-sandbar LCS per vessel per trip (compared to 21 under alternative suite 2) for directed and incidental shark permit holders. Thus, under alternative suite 3, retention limits for sandbar sharks and non-sandbar sharks would be the same for directed and incidental permit holders (see below and Appendix A). Given the reduction in sandbar shark quota and for ease of enforcement, NMFS has removed the distinction between the two classes of permits in terms of sandbar and non-sandbar LCS under alternative suite 3. In addition, the status quo retention limits for SCS and pelagic sharks would still apply (*i.e.*, no trip limit for directed shark permit holders; 16 SCS and pelagic sharks combined for incidental permit holders). Currently, there is a 4,000 lb dw LCS trip limit for directed shark permit holders and 5 LCS trip limit for incidental permit holders. The average number of sandbars and non-sandbar LCS landed per trip for directed permit holders was 35 sandbars and 32 non-sandbar LCS and 2 sandbar sharks and 3 non-sandbar LCS for incidental permit holders from 2003 to 2005 (Table 4.11). Therefore, the retention limits under alternative suite 3 would be a 91-percent reduction for sandbar sharks and a 69-percent reduction in non-sandbar LCS for directed permit holders. However, for incidental permit holders, the retention limits of 4 sandbar sharks and 10 non-sandbar sharks would represent an increase compared to what is landed in the incidental fishery under the status quo. For sandbar sharks, the proposed retention limits would represent twice as many sandbar sharks than what is landed under the status quo (*i.e.*, 2 sandbar sharks per trip) and approximately 3 times as many non-sandbar LCS than what is landed under the status quo (*i.e.*, 3 non-sandbar LCS per trip).

However, catch composition of sandbar sharks and non-sandbar LCS differed for BLL trips that directed on sharks (Hale and Carlson, 2007). Based on BLL observer program data, on average, 69 sandbar sharks and 35 non-sandbar LCS were caught in the South Atlantic region and 30 sandbar sharks and 83 non-sandbar LCS in the Gulf of Mexico region per trip (Hale and Carlson, 2007; Table 4.11). Therefore, depending on the region and gear used, the retention limit in alternative suite 3 could result in an 84 to 97-percent reduction in sandbars kept and a 71 to 90-percent reduction in non-sandbar LCS kept on a per trip basis.

Sandbar and non-Sandbar LCS discards

The reduction in landings must also be balanced by any potential increase in discards. As with alternative suite 2, in order to reduce the number of sandbar discards that would occur as fishermen fulfill their non-sandbar LCS retention limit, NMFS based the retention limit of non-sandbar LCS on an average ratio of sandbars to non-sandbar LCS caught in the South Atlantic and Gulf of Mexico regions (1:2.7; Table A.4). In doing so, NMFS set a retention limit (10 non-sandbar LCS per trip; Table A.4) that minimized the sandbar discards that would occur in the South Atlantic region while maximizing the sandbar landings in the Gulf of Mexico region (since the sandbar to non-sandbar LCS ratio is higher in the Gulf of Mexico region than in the South Atlantic region, no sandbar discards are expected in the Gulf of Mexico region given the non-sandbar LCS retention limit).

For instance, the catch ratio of sandbars to non-sandbar LCS in the Gulf of Mexico region is 1:4. A non-sandbar LCS retention limit based on this ratio would result in a 16 non-sandbar LCS retention limit with a 4 sandbar shark retention limit per trip (4 sandbars x 4 = 16 non-sandbar LCS). However, given the 1:1.4 ratio in the South Atlantic, a 4 sandbar shark retention limit per trip would equal a 6 non-sandbar LCS retention limit in the South Atlantic region (4 sandbar sharks x 1.4 = 5.6 non-sandbar LCS). Therefore, setting one retention limit based on the Gulf of Mexico's catch ratio would result in excessive sandbar sharks discards in the South Atlantic region.

To determine the number of sandbar discards that would occur in the South Atlantic with a non-sandbar LCS retention limit based on the Gulf of Mexico catch composition, NMFS first determined the difference in the retention limits for non-sandbar LCS based on the respective ratios in the two regions. It should be noted that setting a non-sandbar LCS retention limit using the South Atlantic ratio would result in no sandbar discards; any non-sandbar LCS retention limit above that threshold (*i.e.*, above the sandbar shark x 1.4 threshold) would result in sandbar discards, but the number of discards would depend on the difference between the two retention limits divided by the South Atlantic's non-sandbar LCS ratio to sandbar sharks (*i.e.*, 1.4):

- Gulf of Mexico non-sandbar LCS retention limit = 4 sandbars x 4 = 16 non-sandbar LCS
- South Atlantic non-sandbar LCS retention limit = 4 sandbar sharks x 1.4 = 5.6 non-sandbar LCS (or 6 non-sandbar LCS)
- 16 non-sandbar LCS retention limit based on Gulf of Mexico 1:4 ratio - 6 non-sandbar LCS retention limit based on South Atlantic 1:1.4 ratio = 10 non-sandbar LCS;
- 10 non-sandbar LCS /1.4 = 7 sandbar sharks discarded per trip;
- 7 sandbar sharks x 290 South Atlantic trips = 2,071 sandbar sharks discarded in the South Atlantic; and
- 2,071 sandbar sharks x 40.5 lb dw [average commercial sandbar weight] = 83,875.5 lb dw or 38 mt dw.

Therefore, setting a non-sandbar LCS retention limit in the South Atlantic based on the Gulf of Mexico's catch ratio could result in approximately 38 mt dw of sandbar shark discards. These discards would occur as fishermen meet their sandbar retention limit but continue to fish to fulfill their non-sandbar LCS retention limit in the South Atlantic.

An alternate approach would be to implement a non-sandbar LCS retention limit based on the South Atlantic catch composition. However, this would translate into approximately only 163.2 mt dw of the 541.2 mt dw of the non-sandbar LCS being harvested (116.6 mt dw sandbar quota x 1.4 = 163.2 mt dw). Another alternative would be to set separate retention limits for the Atlantic and Gulf of Mexico regions. However, as discussed in the Region section below (Section 4.3.6), under alternative 3, NMFS would only implement one region due to reduced quotas and to simplify quota monitoring. In addition, there could be difficulty in enforcing different regional retention limits. Therefore, NMFS would establish one retention limit that is applied everywhere. To balance the harvest of as much of the non-sandbar LCS quota as

possible while limiting sandbar shark discards, NMFS chose to establish non-sandbar LCS retention limits based on an average regional catch composition.

However, basing the non-sandbar LCS retention limit on the average regional catch composition still results in a non-sandbar LCS retention limit under alternative suite 3 (10 non-sandbar LCS per trip) that is higher than the sandbars to non-sandbar LCS ratio for the South Atlantic (6 non-sandbar LCS per trip), which could result in sandbar shark discards in the South Atlantic (~15.4 mt dw; Table A.4). While this results in total discards that are 2.5 times higher than sandbar discards under the status quo (Table 4.1), these discards are offset by the amount of sandbar landings not caught in the Gulf of Mexico region based on the 10 non-sandbar LCS trip limit (~10.7 mt dw; Table A.4). This ultimately could result in only 105.9 mt dw of the 116.6 mt dw sandbar quota being harvested under alternative suite 3 (*i.e.*, based on the 1:4 ratio in the Gulf of Mexico, 10 non-sandbar LCS retention limit / 4 = 3 sandbar sharks caught per trip in the Gulf of Mexico region when the non-sandbar LCS retention limit is filled. This is one less than the four sandbar shark trip limit under alternative suite 3, resulting in approximately ~10.7 mt dw of sandbar shark quota being uncaught in the Gulf of Mexico region).

Overall total landings and discards of sandbar sharks under alternative suite 3 is 82-percent less (608.2 mt dw) than the total landings and discards under alternative suite 1, the status quo (Table 4.1 and Table 4.2):

- status quo: 728 mt dw in landings + 9.6 mt dw in discards = 737.6 mt dw total;
- alternative suite 3: 105.9 mt dw in landings + 23.5 mt dw in discards = 129.4 mt dw;
- 737.6 mt dw – 129.4 mt dw = 608.2 mt dw;
- 608.2 mt dw / 737.6 mt dw = 82-percent reduction in discards.

Under alternative suite 3, the total commercial landings and discards plus an estimated 27 mt dw of recreational landings (156.4 mt dw total) is still below the 158.3 mt dw sandbar TAC. Therefore, quotas and retention limits under alternative suite 3 would meet the rebuilding plan for sandbar sharks and would have positive ecological impacts on this stock.

Based on the LCS retention limit under alternative suite 3, non-sandbar LCS landings would be below the non-sandbar LCS quota (229.2 mt dw of the 541.2 mt dw quota are estimated to be caught; Table 4.2). This is due to the ratio approach taken under alternative suite 3 to limit the number of sandbar shark discards. The only way fishermen could potentially harvest the entire non-sandbar LCS quota would be to reduce sandbar shark landings (*i.e.*, even lower than 105.9 mt dw) to accommodate for presumably more sandbar shark discards with a higher non-sandbar LCS retention limit. Therefore, to balance sandbar landings with regulatory discards, NMFS is proposing a ratio approach for setting non-sandbar LCS retention limits, at this time. In addition, this retention limit would decrease non-sandbar LCS discards by an estimated 66 percent compared to the status quo (Table 4.1). Under the status quo, fishermen would continue to direct on sharks with a 4,000 lb dw directed LCS trip limit. This resulted in 117.4 non-sandbar LCS in the past (Table 4.1). However, under alternative suite 3, fishermen will only be able to retain a total of 14 sandbar and non-sandbar LCS per trip or an approximate 500 lb dw combined sandbar and non-sandbar LCS trip limit. This is an 86 percent reduction in

the retention limit compared to the status quo. Therefore, it is assumed that fishermen will no longer be able to direct on sandbar and non-sandbar LCS as they have in the past. Rather, they will catch sharks incidentally as they target other species. Fisheries that target other fish and incidentally catch sharks tend to be lower in their discards of sharks (Carlson and Bethea, 2007; Hale and Carlson, 2007). However, since sandbar sharks could be retained on PLL gear under alternative suite 3, it is assumed that PLL vessels may set some BLL gear to catch sharks resulting in some discards of non-sandbar LCS on BLL gear set by PLL fishermen (Table 4.1). Finally, because the retention limit of non-sandbar LCS (*i.e.*, 10 non-sandbar LCS per trip) would be above the average number of non-sandbar LCS that incidental permit holders have retained in the past (*i.e.*, 3 non-sandbar LCS per trip; Table 4.11), it is assumed that incidental permit holders would not discard non-sandbar LCS. If these assumptions hold true, then alternative suite 3 would have positive ecological impacts for non-sandbar LCS.

Dusky shark discards

It is also assumed that any reduction in fishing effort due to the reduced sandbar and non-sandbar LCS quotas under alternative suite 3 could result in a slight decrease of dead discards of dusky sharks, resulting in some positive ecological impacts for this stock. As mentioned in alternative suite 2, it is estimated that, on average, 33.2 mt dw of dusky sharks have been landed or discarded dead (this includes recreational harvest) from 2003 to 2005 (Table 4.1). The majority of the discards under the status quo came from shark directed BLL sets (which include BLL sets fished by PLL vessels) (Table 4.1). As with non-sandbar LCS, it is assumed that since retention limits for sandbars and non-sandbar LCS have been reduced, fishermen would not be directing their effort on shark as they have in the past. However, sandbar sharks could be retained on PLL gear under alternative suite 3; therefore, it is assumed that PLL vessels may set BLL gear to catch sharks, resulting in discards of dusky sharks on BLL gear set by PLL fishermen (Table 4.1). In addition, mortality of dusky sharks would still be realized by other parts of the commercial and recreational fishing sector (Table 4.1). Therefore, it is estimated that alternative suite 3 may reduce dusky shark discards and landings by only 38 percent (Table 4.1).

Porbeagle shark discards

Under alternative suite 3, porbeagle sharks would also be prohibited in the commercial and recreational sectors. As with alternative suite 2, based on HMS Logbook data from 2001 to 2005, 1,895 porbeagle sharks were reported discarded alive, 558 were reported as discarded dead, and 78 were reported as being kept over those 5 years. Therefore, the prohibition is expected to have neutral to slightly positive ecological impacts for this stock since the United States makes minimal landings of this species. As described in alternative suite 2, prohibiting the retention of porbeagle sharks is anticipated to increase dead discards by approximately 0.4 porbeagle sharks per year. Prohibition of porbeagle sharks would prevent any potential increase in fishing effort for this species, and increase the likelihood that porbeagle sharks would rebuild in the timeframe recommended by the stock assessment (100 years).

4.3.3 Time/Area Closures

Under alternative suite 3, NMFS would maintain the mid-Atlantic shark closed area to BLL gear and the current BLL closures in the Caribbean that were implemented in February

2007, (72 FR 5633). Therefore, the ecological impacts associated with these closures would be the same as described under alternative suite 1. In addition, under alternative suite 3 NMFS would implement the SAFMC's MPAs as described under alternative suite 2. Therefore, the ecological impacts associated with the MPAs would be the same as described in alternative suite 2.

4.3.4 Reporting

This alternative suite would modify the reporting frequency for dealers and could result in positive ecological impacts. The requirement for dealer reports to be post-marked within 10 days after each reporting period (1st through 15th and 16th through last day of month), would be modified to state that dealer reports must be *received* by NMFS not later than 10 days after each reporting period (i.e., 25th and 10th of each month). Shark dealers would have to submit these reports in advance of the 10th and 25th of each month to ensure time for delivery, depending on the means employed for report submission. Requiring that all dealer reports are actually received by the Agency in a more timely fashion would help enforce cases against dealers who are not in compliance with the bimonthly reporting requirement. Timely bimonthly report will allow the Agency to better assess quantities of sharks landed and whether or not a closure or other management measures are warranted to prevent overharvests. This could decrease the likelihood that extensive overharvests of sharks would occur. Dealers would still be required to submit reports indicating that no sharks, swordfish, or tuna were purchased during inactive periods. Requirements for vessel logbooks and observer coverage would remain unchanged.

As described in alternative suite 2, sharks reported as unclassified on shark dealer reports would be counted as sandbar sharks. This is expected to result in ecological benefits as it may decrease the likelihood of overharvests, improve the accuracy of shark dealer reports, and improve the utility of these data for future stock assessments.

4.3.5 Seasons

This alternative suite would implement the same measures as alternative suite 2 for seasons. The fishing season would open for all shark species/complexes when this amendment becomes effective in 2008, and then on January 1 in 2009 and thereafter, depending upon available quota. Upon reaching 80 percent of a species/complexes quota, NMFS would take action to close that fishery within five days of filing with the Federal Register. Closing the fishery at 80 percent would provide a buffer that may account for landings that occur outside of NMFS' jurisdiction (i.e., state waters). NMFS would establish one season based on how the retention limits were determined; NMFS anticipates that the lowered retention limits under alternative suite 3 would allow the fishery to stay open longer than what was historically experienced under a 4,000 lb dw LCS directed trip limit. Sandbar and non-sandbar LCS would both close if landings for either species/complex reach 80 percent of the quota. Positive ecological impacts could be expected as a result of implementing these measures because, coupled with conservative retention limits, these seasons are expected to decrease the likelihood of overharvesting a species/complex quota. Therefore, the ecological impacts are expected to be the same as under alternative suite 2.

As stated in alternative suite 2, NMFS is seeking public comment specific to the establishment closing the fishery with five days notice when landings reach 80 percent of any given quota.

4.3.6 Regions

This alternative suite would implement the same measures as alternative suite 2 for regions. Sharks would no longer be managed on a regional basis in the North Atlantic, South Atlantic, and Gulf of Mexico due to reduced quotas, retention limits, and to simplify quota monitoring. Rather, there would be one region with fisheries opening at the same time for all locales subject to available quota. Therefore, the ecological impacts are expected to be the same as under alternative suite 2. The ecological impacts associated with setting one retention limit for non-sandbar LCS based on one average regional retention limit is discussed above in Section 4.3.2.

4.3.7 Recreational Measures

Recreational measures would be the same as those outlined for alternative suite 2. Recreational Anglers (HMS Angling, HMS Charter Headboat, and Atlantic Tuna General Category permit holders participating in a registered HMS tournament) would only be able to possess species of shark that are easy to identify. Participants would no longer be able to possess: finetooth, blacktip, sandbar, bull, silky, porbeagle, spinner, and blacknose sharks. Reducing the likelihood that sandbar, dusky, and porbeagle are landed in recreational fisheries could have positive ecological impacts because all of these species are overfished and both sandbar and dusky sharks are experiencing overfishing. Therefore, the ecological impacts are expected to be the same as under alternative suite 2.

4.3.8 Ecological Impacts of Alternative Suite 3 on Protected Resources and EFH

This alternative suite would have positive impacts on protected resources, including sea turtles, marine mammals, and smalltooth sawfish as it is expected to reduce fishing effort with gillnet and BLL gear significantly. The protected resources section of alternative suite 1 and Section 3.4 discuss current interactions with protected resources in the shark BLL and shark gillnet fisheries. As outlined under alternative suite 2, the reduced quotas and retention limits for sandbar and non-sandbar LCS would likely reduce the number and duration of trips targeting sharks with BLL and/or gillnet gear and the associated interactions with protected resources. However, as with alternative suite 2, it is difficult to assess how the overall reduction in effort associated with decreased quotas and retention limits would translate into quantitative numbers of reduced interactions with protected resources. Consequently, the ecological impacts of alternative suite 3 on protected resources and EFH would be the same as described under alternative suite 2. One difference between alternative suite 2 and 3 is sandbar sharks would be allowed to be retained on PLL gear under alternative suite 3, whereas retention of sandbar sharks on PLL gear is prohibited under alternative suite 2. Because sandbar sharks could be retained on PLL gear, PLL fishermen may set BLL gear to catch sharks. Therefore, there may be more interactions with protected resources and prohibited species, such as dusky sharks, on BLL gear set by PLL fishermen under alternative suite 3 compared to alternative suite 2 (approximately 11.8 mt dw, Table 4.1).

Social and Economic Impacts

4.3.9 Species Complexes

Under alternative suite 3, NMFS would structure species complexes as they are outlined for alternative suite 2. Therefore, the economic impacts of species complexes would be the same as described in alternative suite 2. The associated economic impacts of the reduced quotas for sandbar sharks, non-sandbar LCS, and porbeagle sharks are discussed in combination with the next section on retention limits.

4.3.10 Quotas and Retention Limits

Alternative suite 3 would allow sharks to be retained by shark directed and incidental permit holders. Therefore, the available sandbar and non-sandbar LCS quota would be spread over a larger universe of commercial permit holders. However, unlike the status quo or alternative suite 2, the retention limits for sandbar sharks and non-sandbar LCS would be the same for both directed and incidental permit holders. Due to the reduced sandbar shark quota and for ease of enforcement, NMFS is proposing to remove the distinction between the two classes of permit in terms of retention limits for sandbar sharks and non-sandbar LCS. Since directed permit holders presumably make a greater percentage of their gross revenues from shark landings, they are expected to have larger negative socioeconomic impacts compared to incidental permit holders. Since the states of Florida, New Jersey, and North Carolina have the most directed permit holders, it is anticipated that these states would have the largest negative socioeconomic impacts under alternative suite 3 (Table 3.32). As with alternative suite 2, shark dealers could also experience negative impacts due to the reduction in the sandbar and other LCS quotas and retention limits, which would reduce the overall amount of sharks being landed.

As with alternative suite 2, NMFS would also maintain the 60 mt ww (43.2 mt dw) shark display and research quota under alternative suite 3. Therefore, the socioeconomic impacts associated with the 60 mt ww shark display and research quota would be the same as described under alternative suite 2.

Fishery level impacts

Under alternative suite 3, the commercial quotas would be reduced to 116.6 mt dw and 541.2 mt dw for non-sandbar LCS. However, to balance discards of sandbar sharks in the South Atlantic with uncaught sandbar quota in the Gulf of Mexico, the non-sandbar LCS retention limit was lowered such that only 105.9 mt dw (233,467 lb dw) of sandbar sharks and 229.2 mt dw (505,294 lb dw) of non-sandbar LCS would be landed under alternative suite 3 (see discussion in Appendix A under “*Non-sandbar quota and retention limits*” and Table A.4 and Table 4.2). Based on 2006 ex-vessel prices, assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight, this is equivalent to \$1,008,027 (Table 4.13). This is a reduction of about 74 percent compared to the current gross revenues under alternative suite 1 (\$3,824,589; Table 4.9).

As with alternative suite 2, porbeagle sharks would be placed on the prohibited list under alternative suite 3. Based on the average porbeagle shark landings from 2002 to 2004 (1.5 mt dw

or 3,402 lb dw) and 2006 ex-vessel prices, this is equivalent to a \$6,081 gross revenue loss in porbeagle shark landings under alternative suite 3 (Table 4.9).

In alternative suite 3, under and overharvests of quota for each category would be removed from the next season's quota, as described under alternative suite 3. Therefore, the socioeconomic impacts associated with the application of under and overharvests would be the same as described under alternative suite 2.

Finally, alternative suite 3 would require that shark fins remain attached to the shark through the first port of landing. As described under alternative suite 2, the overall socioeconomic impact of this could be significant given the reductions in the overall sandbar quota, which are the most lucrative shark due to the value of its fins. Therefore, the impacts of requiring that shark fins remain attached to the shark during the first port of landing are anticipated to be the same as described under alternative suite 2.

Directed permit holder impacts

As stated under alternative suite 2, on average, directed permit holders landed 1,571,851 lb dw of sandbar sharks per year and 1,210,643 of non-sandbar LCS per year from 2003 to 2005 in the Coastal Fisheries and HMS Logbooks. In 2006 ex-vessel prices, this is equivalent to gross revenues of \$3,744,032 (assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight) (Table 4.9). However, given the retention limits for non-sandbar LCS (see Appendix A), it is anticipated that only 105.9 mt dw (233,467 lb dw) of the sandbar sharks and 229.2 mt dw (505,294 lb dw) of non-sandbar LCS would be landed under alternative suite 3. These landings would be spread over directed and incidental permit holders' past effort or a total of 1,143 trips (Table A.2). Based on this past effort, it was assumed 1,108 trips would be made by directed permit holders (see Table A.2; $790 \text{ trips} + 80 \text{ trips} + 237.7 \text{ trips} = 1,108 \text{ trips}$). This directed fishing effort of 1,108 trips is 78 percent of the total expected fishing effort (*i.e.*, $1,108 \text{ trips} / 1,143 \text{ trips} = 78 \text{ percent}$; Table 4.14). Using this estimated effort, it is anticipated that approximately 83 mt dw (183,073 lb dw) of sandbar sharks (78 percent \times 105.9 mt dw = 83 mt dw) and 180 mt dw (396,225 lb dw) of non-sandbar LCS (78 percent \times 229.2 mt dw = 180 mt dw) would be landed by directed permit holders (Table 4.14). Based on 2006 ex-vessel prices, this is equivalent to \$793,338 gross revenues for directed permit holders. This is a 79 percent overall reduction in gross revenues compared to 2003 to 2005 (gross revenues based on current directed permit holders' landings were \$3,744,032; Table 4.9). Again, since the states of Florida, New Jersey, and North Carolina have the most directed permit holders, it is anticipated that these states would experience the largest negative socioeconomic impacts under alternative suite 3 (Table 3.32).

As stated in alternative 2, the status quo revenue was based on a 4,000 lb dw LCS trip limit for directed shark permit holders with average South Atlantic trips at \$4,743 per trip and average Gulf of Mexico trips at \$5,853 per trip (Table 4.11). Under alternative suite 3, the retention limits would be 4 sandbars per trip and 10 non-sandbar LCS per trip. However, since the ratio of sandbars to non-sandbar LCS caught in the Gulf of Mexico is 1:4, only approximately 3 sandbar sharks would be caught in the Gulf of Mexico region when the 10 non-sandbar LCS retention limit per trip is filled ($10 \text{ non-sandbar LCS} / 4 = 2.5 \text{ sandbar sharks}$). Therefore, gross revenues on a trip basis are estimated to be \$610 per trip in the South Atlantic

and \$670 per trip in the Gulf of Mexico (Table 4.15). From 2003 to 2005, there were 128 vessels that averaged more than 163 lb dw (or 4 sandbar sharks) of sandbar per trip (Figure A.3). Therefore, these vessels would be most negatively affected by retention limits under alternative suite 3.

Table 4.15 Gross revenues on a trip basis in the South Atlantic (SA) and Gulf of Mexico (GOM) under alternative suite 3.

Alternative Suite 2	Number of sandbars	Landings (lb dw)*	Fin Weight (5% of landings per trip)	Fin 2006 ex-vessel price (lb dw)	Fin revenue	Carcass Weight (95% of landings per trip)	Carcass 2006 ex-vessel price (lb dw)	Carcass Revenue	Total gross revenue
<i>Regionally based BLL trips (Directed and Incidental Permit Holders)</i>									
Total sandbar sharks per trip in SA	4	162	8	\$16.20	\$131	154	\$0.38	\$58	\$190
Total sandbar sharks per trip in GOM	3	122	6	\$20.65	\$125	115	\$0.40	\$46	\$172
Total non-sandbar LCS per trip in SA	10	337	17	\$16.20	\$273	320	\$0.46	\$147	\$420
Total non-sandbar LCS per trip in GOM	10	337	17	\$20.65	\$348	320	\$0.47	\$150	\$498
SA trip total revenues from sharks									\$610
GOM trip total revenues from sharks									\$670

Incidental permit holder impacts

On average, incidental permit holders landed 19,066 lb dw of sandbar sharks and 39,995 lb dw of non-sandbar LCS from 2003 to 2005 as reported in the Coastal Fisheries and HMS Logbooks. In 2006 ex-vessel prices, this is equivalent to gross revenues of \$80,558 (assuming 5 percent of the landings are fins and 95 percent of the landings are carcass weight) (Table 4.9). Again, based on the non-sandbar LCS retention limits, it is predicted that 105.9 mt dw of sandbar sharks would be landed and 229.2 mt dw of non-sandbar LCS would be landed under alternative suite 3. This was averaged over directed and incidental permit holders' past effort or 1,413 trips (Table A.2). Based on past effort, it was assumed 305 trips could be made by incidental permit holders (see Table A.2; 49.7 trips + 255.3 trips = 305 trips). This is 22 percent of the expected fishing effort (305 trips / 1,413 trips = 22 percent; Table A.2 and Table 4.14). Based on this estimate effort, it is anticipated that approximately 23 mt dw (50,395 lb dw) of sandbar sharks (22 percent x 105.9 mt dw = 23 mt dw) and 50 mt dw (109,069 lb dw) of the non-sandbar LCS (22 percent x 229.2 mt dw = 50 mt dw) are anticipated to be landed by incidental permit holders (Table 4.14). Based on 2006 ex-vessel prices, this is equivalent to \$218,383 gross revenues for incidental permit holders (Table 4.14). This would result in gross revenues that are 2.7 times higher compared to 2003 to 2005 (gross revenues based on current incidental permit holders' landings were \$80,558; Table 4.9).

This increase in gross revenues is due to the increase in retention limits for incidental permit holders. Under the status quo, incidental permit holders can retain 5 sharks from the LCS complex. However, under alternative suite 3, incidental permit holders would be able to retain 4 sandbars and 10 non-sandbar LCS or 14 LCS total. This retention limit is almost 3 times higher than what is currently allowed under the status quo. On average, incidental permit holders have been landing 2 sandbar sharks and 3 non-sandbar LCS per trip. Based on 2006 ex-vessel prices, this is equivalent to \$248 per trip (Table 4.11). However, under alternative suite 3, incidental permit holders would potentially make equivalent gross revenues per trip as directed permit holders: \$610 per trip in the South Atlantic and \$670 per trip in the Gulf of Mexico (Table 4.15). This would result in gross revenues for incidental permit holders that are 2 to 3 times higher than gross revenues in 2003 to 2005 depending on future fishing effort and catch composition. Therefore, there would be positive economic impacts for incidental permit holders under alternative suite 3. Since approximately 66 vessels with incidental permit holders landed sandbar sharks or non-sandbar LCS from 2003 to 2005 in the Coastal Fisheries and HMS Logbooks, these 66 vessels would have the largest economic benefits under alternative suite 3. However, if sharks become profitable for incidental permit holders under alternative suite 3, then more vessels with incidental permits may actively land sandbars and non-sandbar LCS in the future. Finally, the states of Florida, Louisiana, New Jersey, and North Carolina had the most incidental shark permit holders in 2007 (Table 3.32). Therefore, these states would see the largest socioeconomic benefits under alternative suite 3.

4.3.11 Time/Area Closures

Under alternative suite 3, NMFS would maintain the mid-Atlantic shark closed area to BLL gear and the current BLL closures in the Caribbean that were implemented in February 2007, (72 FR 5633). Therefore, the economic impacts associated with these closures would be

the same as described under alternative suite 1. In addition, under alternative suite 3, NMFS would implement the SAFMC's MPAs as described under alternative suite 2. Therefore, the economic impacts associated with the MPAs would be the same as described in alternative suite 2.

4.3.12 Reporting

This alternative suite could result in neutral economic impacts. Shark dealers would still be required to submit landings data twice a month, however, they would need to ensure that it is actually *received* by the Agency within 10 days of a bimonthly reporting period ending. Currently, shark dealers simply have to ensure that the landings reports submitted to NMFS are *post-marked* within 10 days of the end of a reporting period. Additional burden is not expected as a result of modifying the regulations to ensure that dealer reports are actually received. Furthermore, more timely reporting and receipt of information by the Agency may result in a decreased likelihood that quotas would be exceeded and overharvests removed from forthcoming shark seasons resulting in neutral or slightly positive economic impacts.

As described in alternative suite 2, this suite would change how sharks listed as unclassified on shark dealer reports are accounted for under quota monitoring. Unclassified sharks would be counted as sandbar sharks, and not as LCS, which is the current procedure under quota monitoring. Properly identifying sharks may result in negative economic impacts in the short-term because it may take slightly more time. Submission of accurate shark dealer data may result in positive economic impacts in the long-term as it would improve quota monitoring, decrease the likelihood of extensive overharvests and subsequent closures, and improve the results from stock assessments by ensuring data is more accurate and includes species specific information.

4.3.13 Seasons

Under alternative suite 3, NMFS would establish one season that would open when this amendment becomes effective in 2008, and then on January 1 in 2009 and thereafter, depending on available quota. Based on how the retention limits were determined (*i.e.*, NMFS accounted for mortality in all other fisheries, and then spread the available quota over the number of historical trips taken by directed and incidental permit holders; see Appendix A), NMFS anticipates that the lowered retention limits under alternative suite 3 would allow the fishery to stay open longer than what was historically experienced under a 4,000 lb dw LCS directed trip limit. However, as described above, when coupled with the measures included under regions (Section 4.2.5), this alternative suite could have negative economic impacts on vessels and dealers in the North Atlantic, depending on when shark quotas were filled throughout the year. Thus, this alternative suite is expected to similar socioeconomic impacts due to establishing one season as discussed under alternative suite 2.

As mentioned in Section 4.2.5, the Agency anticipates that providing five days notice once 80 percent of the quota has been harvested would reduce the likelihood of an overharvest, account for landings that may occur outside of NMFS jurisdiction after a season had been closed, and would implement the necessary accountability measures under the Magnuson-Stevens Act.

However, the Agency is seeking specific comments on the potential economic impacts of choosing 80 percent as the threshold to close a specific shark fishery with five days notice.

4.3.14 Regions

Similar to alternative suite 2, eliminating regions would likely have negative economic impacts on regions that do not have sharks present year round. The North Atlantic region would be disadvantaged as a result of reverting back to one region, versus three, as they would not have a secure regional trimester quota to ensure they would have a shark fishery in adjacent waters when sharks are present. Vessels could either move to southern areas to participate in the shark fishery in areas where sharks are present year-round or redistribute fishing effort to other fisheries. Dealers in the North Atlantic region would also be affected, possibly even more so than vessels, as the likelihood of having shark products consistently would be decreased.

4.3.15 Recreational Measures

As under alternative suite 2, this suite would restrict the species of Atlantic sharks that could be possessed by anglers in possession of a HMS Charter/Headboat permit, HMS Angling permit, or a Atlantic Tuna General Category permit (if participating in a registered HMS tournament). The Agency would restrict landings of sharks to those species that are relatively simple to identify. Therefore, recreational shark fisheries would experience similar negative economic impacts as under alternative suite 2 as a result of reducing the number of shark species that could be legally landed (Table 4.8).

Conclusions

This alternative suite could have similar positive ecological impacts for most species of sharks, bycatch, and protected resources as a result of significantly reduced retention limits and quotas for sandbar sharks and reduced retention limits for non-sandbar LCS as under alternative suite 2. Alternative suite 3 would require that sharks be landed with their fins still attached, similar to alternative suite 3; this requirement could prevent fishermen from keeping the fins from sharks that are not landed, resulting in a reduction of overall shark mortality. These positive ecological impacts would likely be more pronounced for some species under alternative suite 3 compared to alternative suite 2 because retention limits, and subsequent discards, would be lower under alternative suite 3 (Table 4.1). Since this alternative suite would allow directed and incidental permit holders to retain sharks, fewer discards of sandbar sharks are anticipated (Table 4.1).

Under alternative suite 3, NMFS would maintain the current time/area closures and implement eight MPAs that are being preferred in the SAFMC's Amendment 14A. This is due to enforceability issues where the gears for different fisheries (*i.e.*, shark BLL gear and snapper/grouper BLL gear) are virtually indistinguishable, and many fishermen hold both types of permits. However, despite these time/area closures, alternative suite 3 would have a smaller reduction in dead discards of dusky sharks compared to alternative suite 2 since sandbar sharks would be allowed to be retained on PLL gear under alternative suite 3 (Table 4.1).

While most ecological impacts are positive under alternative suite 3, overall, economic impacts would vary depending on permit type. For instance, the retention limits under alternative suite 3 are higher than retention limits for incidental permit holders under the status quo, possibly resulting in positive economic impacts for incidental shark permit holders (Table 4.9 and Table 4.14). However, negative economic impacts are expected for directed permit holders (79-percent reduction in gross revenues compared to the status quo; Table 4.9 and Table 4.14). These losses in gross revenues may be exacerbated by the requirement to land shark with their fins attached. In addition, eliminating regions and seasons would represent an economic disadvantage to the North Atlantic region as sharks are not present in these waters year-round, meaning the quota may be filled in some years before sharks are present in these areas. The elimination of seasons and regions combined with limiting underharvest carry-overs may have negative economic impacts on fishermen, especially for regions that consistently had underharvests of species like SCS.

NMFS would also rely on dealer reports on a biweekly basis to monitor the sandbar, non-sandbar LCS, SCS, and pelagic shark quotas. If dealers fail to report in a timely fashion, overharvests could occur, especially for the much reduced 116.6 mt dw sandbar quota. Finally, given the retention limits for sandbar and non-sandbar LCS are significantly lower than what is under the status quo (91 and 69-percent reduction in sandbar and non-sandbar LCS retention limits, respectively for directed permit holders), it is anticipated that there would be no directed shark fishery as a result of alternative suite 3. While an observer program would still operate under alternative suite 3, without a directed shark fishery, it is anticipated that the fishery dependent data collection would be limited, which could compromise data collection for future stock assessments. Alternative suite 4 would likely accomplish the necessary reductions in quota, retention limits, and fishing effort to prevent overfishing and allow stocks to rebuild while collecting valuable scientific data for the Agency. Therefore, due to concerns over dusky discards, quota monitoring, and data collection, NMFS is not preferring alternative suite 3 at this time.

4.4 Alternative Suite 4: Establish a Research Fishery for Sandbar Sharks; Shark Fishery for Directed, Incidental, HMS Angling, and HMS Charter/Headboat Permit Holders – Preferred Alternative

Overall Summary

As with alternative suites 2 and 3, under alternative suite 4, NMFS would remove the sandbar shark from the LCS complex and establish a separate sandbar shark quota and a non-sandbar LCS quota (LCS complex minus sandbar sharks). Overharvests would be removed from the next season's quota. Underharvests for species that are healthy or rebuilt would be transferred to the next season's quota, up to 50 percent of the base quota. For species/complexes that are unknown, overfished, or experiencing overfishing, underharvests would not be transferred to the next season's quota. Quotas would be as follows: Sandbar = 116.6 mt dw; non-sandbar LCS = 541.2 mt dw; SCS = 454 mt dw; Blue Sharks = 273 mt dw; Pelagic Sharks (Other than Blue Sharks) = 488 mt dw; Porbeagle Sharks = Prohibited (0 mt dw quota); and Display and Scientific Research = 60 mt ww (Sandbar = 2.8 mt ww (2 mt dw); and all other shark species (except dusky sharks) = 57.2 mt ww (41.2 mt dw).

Alternative suite 4 would establish a small research fishery that would harvest the entire 116.6 mt dw sandbar quota. Vessels within the research fishery could also retain non-sandbar LCS, SCS, and pelagic sharks (except porbeagle sharks). Vessels with commercial shark permits outside of the research fishery could only retain non-sandbar LCS as well as SCS and pelagic sharks (except porbeagle sharks) (see Table 2.1). The existing BLL and PLL time/area closures, including the Caribbean BLL closures for EFH, would remain in place. In addition, NMFS would implement the eight MPAs off South Carolina to Florida as requested by the SAFMC.

Retention limits for sandbar sharks and non-sandbar LCS in the research fishery would be based upon research objectives; no sandbar sharks may be landed outside of research program; 22 non-sandbar LCS per vessel per trip for directed and incidental permit holders not participating in research program; no trip limit for SCS or pelagic sharks (except porbeagle sharks) for directed permit holders; 16 SCS and pelagic sharks (except porbeagle sharks) combined for incidental permit holders; no retention of porbeagle sharks by commercial or recreational fishermen; and all sharks landed with fins attached.

Dealer reports must be received by NMFS within 14 days, and there would be 100 percent observer coverage for vessels participating in sandbar shark research program. Other logbook and observer requirements would be maintained for vessels not participating in research program, and all unclassified sharks reported would be categorized as sandbar sharks. There would be one season starting on January 1 of each year and one region. The sandbar and non-sandbar LCS fishery would close when landings of either reach 80 percent of the available quota with a five day notice, and SCS and pelagic shark fisheries would close when SCS and pelagic shark landings reach 80 percent of their respective quotas. Finally, recreational fishermen could land bonnethead, nurse, tiger, lemon, hammerheads, Atlantic sharpnose, shortfin mako, common thresher, oceanic whitetip, and blue sharks. The recreational possession limit would be 1 shark > 54" per vessel per trip, and 1 Atlantic sharpnose and 1 bonnethead per person per trip with no minimum size requirements.

Ecological Impacts

4.4.1 Quotas/Species Complexes

Under alternative suite 4, NMFS would structure species complexes as they are outlined for alternative suite 2. The commercial sandbar shark quota would remain at 116.6 mt dw and the commercial non-sandbar LCS quota would remain at 541.2 mt dw. The shark display and research quota would have 2 mt dw (2.8 mt ww) allocated for sandbar sharks and 41.2 mt dw (57.2 mt ww) allocated for all non-sandbar LCS species (except dusky sharks). Porbeagle sharks would be added to the prohibited species list. The commercial quotas would be divided among participants operating within and outside a shark research fishery. All of the 116.6 mt dw (257,056 lb dw) quota for sandbar sharks would be allocated to the vessels operating in the research fishery. NMFS determined this quota by accounting for sandbar shark mortality that occurs in recreational and non-HMS fisheries, including discards as the result of fishermen targeting other shark species outside the research fishery. This assumes that shark fishermen outside the research fishery would be fishing in a manner similar to how incidental permit have fished historically, therefore, they would have comparable sandbar shark discards as incidental permit holders have had in the past (see Table 4.1 and calculation of sandbar quota in Appendix

A and Table A.1). It is anticipated that 50 mt dw (110,230 lb dw) of the non-sandbar LCS quota would be caught incidentally while fishermen fulfilled the 116.6 mt dw of sandbar quota in the research fishery (see Appendix A, Table A.5). The remaining non-sandbar LCS quota would be allocated to vessels fishing outside the shark research fishery. Despite the division of the quotas among vessels operating within and outside of a research fishery, the total quota for sandbar sharks and non-sandbar LCS would still be based on recommendation from the most recent LCS stock assessment. Therefore, this level of fishing effort would allow sandbar sharks to rebuild and stop overfishing of this stock while keeping fishing mortality consistent with past landings for blacktip sharks. As such, the species complexes and associated quotas would have positive ecological impacts under alternative suite 4. A more detailed analysis of the ecological impacts of the quotas under alternative suite 4 is outlined in the next section under retention limits. Finally, under and overharvests would be applied as they have been outlined for alternative suite 2, and therefore, there would be similar ecological impacts associated with under and overharvests as described under alternative suite 2.

4.4.2 Retention Limits

As with alternative suites 2 and 3, alternative suite 4 would require that shark fins remain on the shark until the first port of landing, and therefore, is expected to have similar ecological benefits as described for alternative suites 2 and 3.

Alternative suite 4 would establish a program where vessels with directed and incidental shark permits could apply and be selected to participate in a research fishery for sharks. Only vessels participating in this program could land sandbar sharks. Vessels not participating in the research program would still be able to land non-sandbar LCS, SCS, and pelagic sharks subject to the retention limits described in Chapter 2 and Appendix A (Tables 2.1 and A.5). Each year NMFS would publish a call for proposals that outlined the shark research objectives for the year. Shark fishermen who were interested in participating would apply for the shark research fishery under the exempted fishing program within the Highly Migratory Species Management Division. Based on the research objectives for a given year, NMFS scientists and managers would select a few vessels (*i.e.*, 5-10 vessels) each year to conduct the prescribed research. Selection criteria of vessels include the ability of the vessel to meet the Agency's annual research objectives, flexibility to fish in the region and season required, and the ability to carry a NMFS-approved observer. Vessels that do not have recent and/or excessive number of fishery regulation violations, as determined by the Office of Law Enforcement, will be ranked higher than vessels that do have recent and/or excessive number of fishery regulation violations. Selected vessels would work with NMFS to conduct shark research; vessels selected for the research fishery would be subject to 100 percent observer coverage; however, fishermen in the shark research fishery would be afforded higher trip limits and could sell their catch, including sandbar sharks, compared to vessels outside the research fishery. This research fishery would allow the collection of fishery-dependent data for future stock assessments while allowing NMFS and fishermen to conduct cooperative research to meet the shark research objectives for the Agency.

Vessels operating within the research fishery would be allowed to harvest the entire 116.6 mt dw sandbar shark quota (however, the shark fishery would shut down once 80 percent of the sandbar shark or non-sandbar LCS quota was met to account for state landings and ensure the 116.6 mt dw commercial sandbar quota was not overharvested). Retention limits for sandbar

sharks and non-sandbar LCS would depend on the research objectives of a given year. For example, assuming a catch composition of 70 percent sandbar sharks (and hence, 30 percent non-sandbar LCS) the 116.6 mt dw sandbar quota could be fulfilled in 92 trips with a 4,000 lb dw sandbar and non-sandbar LCS trip limit (70 percent x 4,000 lb dw trip limit = 2,800 lb dw sandbar sharks per trip; 92 trips x 2,800 lb dw of sandbar sharks = 257,600 lb dw or 116.6 mt dw; see Appendix A, Table A.2). Based on this catch composition, it is anticipated that 50 mt dw (110,230 lb dw) of the non-sandbar LCS quota would be caught incidentally while fishermen fulfilled the 116.6 mt dw of sandbar quota in the research fishery (30 percent x 4,000 lb dw = 1,200 lb dw of non-sandbar LCS; 92 trips x 1,200 lb dw of non-sandbar LCS per trip = 110,400 lb dw or 50 mt dw; see Appendix A, Table A.5). Actual landings and species composition of trips within the shark research fishery may vary. However, based on this level of harvest of the non-sandbar LCS quota within the research fishery, vessels operating outside of the research fishery would have an estimated 491 mt dw (1,082,459 lb dw) of non-sandbar LCS quota available to them. In total, incidental and directed permit holders are anticipated to land the 116.6 mt dw (257,056 lb dw) and 541.2 mt dw (1,193,130 lb dw) for sandbar and non-sandbar LCS, respectively. Compared to the average annual sandbar landings of 1,590,917 lb dw and non-sandbar LCS landings of 1,250,638 lb dw that were reported from 2003 to 2005 in the Coastal Fisheries and HMS Logbooks by directed and incidental permit holders (Table 4.9), this would be an 84-percent decrease in sandbar landings and a 7-percent decrease in non-sandbar LCS landings under alternative suite 4 (Table 4.2). This reduction in fishing effort is expected to have positive ecological impacts for sandbar sharks.

Vessels operating outside the research fishery would be allowed to retain 22 non-sandbar LCS per trip. On average, directed permit holders landed 32 non-sandbar LCS per trip as reported in the Coastal Fisheries and HMS Logbooks from 2003 to 2005. Therefore, this would be a 31-percent reduction in non-sandbar LCS per trip for directed permit holders. However, on average, incidental permit holders landed 3 non-sandbar LCS per trip as reported in the Coastal Fisheries and HMS Logbooks from 2003 to 2005. Therefore, the number of non-sandbar LCS kept per trip would increase by more than 7 times for incidental permit holders under alternative suite 4. Total landings of non-sandbar LCS by vessels outside the research fishery would be limited to approximately 491 mt dw (depending on how much of the non-sandbar LCS quota is landed in the research fishery), such that the total 541.2 mt dw of the LCS quota would not be exceeded (Table A.5). It is difficult to estimate how modifications to retention limits, implementation of a shark research program, and prohibiting sandbars from being landed outside this program would impact catch composition of BLL sets for sharks.

Since the universe of vessels operating in the research fishery would be limited (*i.e.*, likely 5-10 vessels), it is anticipated that sandbar discards would occur on PLL gear by vessels operating outside the research fishery (approximately 4.3 mt dw; Table 4.1). Shark discards in the research fishery are anticipated to occur as they have during directed shark trips in the past (approximately 0.4 mt dw of sandbar sharks; Table 4.1). In addition, fishermen outside the research fishery would not be allowed to keep sandbar sharks, and assuming they would fish incidentally for sharks as they target other species, it is anticipated that this would result in approximately 2.3 mt dw of sandbar discards per year (Table 4.1). Discards of sandbar sharks under alternative suite 4 could increase by 36 percent compared to the status quo (Table 4.1), however, overall commercial landings and discards would still be reduced by 82 percent

compared to the status quo (Table 4.1 and Table 4.2) because of reductions to the commercial quota and by limiting the number of participants:

- status quo: 728 mt dw in landings + 9.6 mt dw in discards = 737.6 mt dw total;
- alternative suite 4: 116.6 mt dw in landings + 13.1 mt dw in discards = 129.7 mt dw; and
- $737.6 \text{ mt dw} / 129.7 \text{ mt dw} = 607.9 \text{ mt dw}$; $607.9 \text{ mt dw} / 737.6 \text{ mt dw} = 82\text{-percent}$ reduction in discards.

Under alternative suite 4, the total commercial landings and discards plus an estimated 27 mt dw of recreational landings (156.7 mt dw total) is still below the 158.3 mt dw sandbar TAC. Therefore, quotas and retention limits under alternative suite 4 would meet the rebuilding plan for sandbar sharks and would have positive ecological impacts on this stock.

Since the limited number of vessels in the research fishery would be directing on sharks, it is assumed that non-sandbar LCS discards would occur as they have in the past when there were shark directed BLL trips. However, given the non-sandbar LCS retention limit under alternative suite 4 for vessels outside the research fishery (*i.e.*, 22 non-sandbar LCS per trip) is higher than what incidental permit holders have landed in the past (*i.e.*, 3 non-sandbar LCS per trip), discards of non-sandbar LCS by incidental permit holders operating outside the research fishery are estimated to decrease by 63-percent decrease in non-sandbar LCS discards under alternative suite 4 (Table 4.1).

A limited number of dusky discards would continue to occur within, and outside of, the shark research fishery. The universe of vessels and the number of sets deployed in the research fishery would be limited, further limiting the number of interactions with dusky sharks. These sets would all be subject to 100 percent observer coverage, which would provide the Agency with additional information on oceanographic conditions or other factors that might correspond to increased dusky shark abundance. Outside of the research fishery, the limited retention limit for non-sandbar LCS is expected to reduce fishing effort, thereby, reducing the likelihood of interactions with dusky sharks on BLL gear. Dusky sharks are also caught on PLL gear that is set for shark or other HMS. Assuming that there would not be any PLL vessels in the shark research fishery since this gear is not generally used to target sandbar sharks, it is anticipated that the PLL vessels would not continue to set BLL gear for sharks. By calculating the number of dusky discards that are anticipated to still occur based on past landings and discards reported Coastal Fisheries and HMS Logbooks (*i.e.*, landings and discards in the PLL fishery and other fisheries using gillnet and BLL gear; see Table 4.1), it is anticipated that dusky discards could decrease by 72 percent under alternative suite 4, resulting in positive ecological impacts for this stock.

Porbeagle sharks would also be prohibited in the commercial and recreational sectors under alternative suite 4. As with alternative suites 2 and 3, based on HMS Logbook data from 2001 to 2005, 1,895 porbeagle sharks were reported discarded alive, 558 were reported as discarded dead, and 78 were reported as being kept over those 5 years. Therefore, the prohibition is expected to have neutral to slightly positive ecological impacts for this stock since the United States has minimal landings of this species as described under alternative suite 2.

Finally, as with alternative suites 2 and 3, alternative suite 4 would partition the 60 mt ww (43.2 mt dw) quota for exempted fishing permits, display permits, scientific research permits, and letters of acknowledgement to place more stringent limits on the quantity of sandbar and dusky sharks authorized for these purposes. This quota would be separate from the commercial quotas set up for the small research shark fishery that would be conducted by industry vessels outlined above. Therefore, the ecological impacts associated with the 60 mt ww quota would be the same ecological impacts as those under alternative suite 2.

4.4.3 Time/Area Closures

Under alternative suite 4, NMFS would maintain the mid-Atlantic shark closed area and the current BLL closures in the Caribbean that were implemented in February 2007, (72 FR 5633). Therefore, the ecological impacts associated with these closures would be the same as described under alternative suite 1. In addition, under alternative suite 4, NMFS would consider implementing the SAFMC's MPAs as described under alternative suite 2. Therefore, the ecological impacts associated with the MPAs would be the same as described in alternative suite 2.

4.4.4 Reporting

Reporting requirements for shark dealers would be the same as described in alternative suite 3 (Section 4.3.4) and could have neutral ecological impacts. Participants selected to participate in the shark research program would be subject to 100 percent observer coverage as a requirement for eligibility to participate in the program. Increasing observer coverage for vessels participating in this program would result in positive ecological impacts because observer reports could be used to monitor landings, bycatch, and interactions with protected resources in near "real-time." Vessels outside the shark research program would still be required to carry an observer if selected and all vessels would still be required to complete logbooks within 48 hours of fishing activity and then submit the logbooks to NMFS within seven days.

As described in alternative suites 2 and 3, counting all unclassified sharks from shark dealer reports as sandbar sharks under quota monitoring would reduce the likelihood of overharvests, improve the accuracy of shark dealer reporting, and increase the quality of data used in stock assessments by ensuring that shark dealer reports more accurately reflect what sharks were purchased by dealers resulting in positive ecological impacts.

4.4.5 Seasons

Seasons would be the same as described for alternative suites 2 and 3, however, since all sandbar sharks would be landed by a limited number of vessels participating in a shark research program, the Agency would have more information concerning when the sandbar shark quota is expected to be reached. This may result in positive ecological impacts because it may reduce the likelihood of overharvests. The Agency is interested in collecting biological samples from sandbar and non-sandbar LCS throughout the year, therefore, the Agency would determine when the research vessels would fish to ensure adequate spatial and temporal sampling throughout the year. Fishing effort, non-LCS landings, and sandbar discards outside the research fishery would

be monitored via biweekly dealer reports and the shark observer program. Once the non-sandbar LCS quota reaches 80 percent, the sandbar and non-sandbar fishery would be closed within 5 days. SCS and pelagic shark quotas (minus porbeagle sharks) would be monitored and closed in the same way. Closing the fishery with five days notice upon achieving 80 percent of a respective quota would provide a buffer for landings that may occur outside of NMFS' jurisdiction (*i.e.*, state waters) after a season has been closed. The Agency is seeking public comment specific to the appropriateness of closing the fishery with five days notice upon reaching 80 percent of respective quotas.

4.4.6 Regions

As described in alternative suites 2 and 3, this alternative suite would implement a single region. All of the sandbar quota and approximately 50 mt dw of the non-sandbar LCS would likely be landed in the shark research program. One of the criteria for participation in the shark research program would be to ensure that the Agency maintains adequate regional coverage when selecting vessels to attain a variety of biological samples from different regions and at different times of year. Therefore, the ecological impacts associated with one region under alternative suite 4 would be the same as the ecological impacts outlined for alternative suite 2.

4.4.7 Recreational Measures

Recreational measures would be the same as those outlined for alternative suite 2 and 3. Recreational Anglers (HMS Angling, HMS Charter Headboat, and Atlantic Tuna General Category permit holders participating in a registered HMS tournament) would only be able to possess shark species that are easy to identify (Table 4.8). Participants would no longer be able to possess: finetooth, blacktip, sandbar, bull, silky, porbeagle, spinner, and blacknose sharks. Reducing the likelihood that sandbar, dusky, and porbeagle are landed in recreational fisheries could have positive ecological impacts because all of these species are overfished and both sandbar and dusky sharks are experiencing overfishing. Therefore, the ecological impacts are expected to be the same as under alternative suite 2.

4.4.8 Ecological Impacts of Alternative Suite 4 on Protected Resources and EFH

This alternative suite could have positive impacts on protected resources, including sea turtles, marine mammals, and smalltooth sawfish as it is expected to reduce overall fishing effort targeting sharks with gillnet and BLL gear while increasing the level of observer coverage on a limited number of vessels participating in a shark research program. The protected resources section of alternative suite 1 and Section 3.4 discuss current interactions with protected resources in the shark BLL and shark gillnet fisheries. This alternative would implement the same quotas for sandbar and non-sandbar LCS, which are expected to reduce fishing effort, prevent overfishing, and rebuild overfished stocks. Retention limits for non-sandbar LCS would also be reduced significantly (22 non-sandbar LCS per vessel per trip) for vessels with shark permits outside the shark research program. While vessels in the shark research program would fish under the trip limits dictated by the research objectives in a given year, there would be a significant reduction in the number of trips directing on sharks because the quota for sandbar sharks would be drastically reduced. In addition, all of these trips would be subject to 100 percent observer coverage. Furthermore, the Agency would determine when these trips would

take place throughout the year to ensure regional and seasonal sampling by scientific observers. This shark research program may also provide additional documentation and additional opportunities for data collection on interactions with protected resources via observer reports.

As described under alternative suites 2 and 3, shark fishermen outside of the shark research program could reduce the number, duration, and frequency of trips targeting sharks with BLL and/or gillnet gear. In addition, ecological impacts to EFH would likely be positive and similar as those outlined under alternative suite 2.

Social and Economic Impacts

4.4.9 Species Complexes

Under alternative suite 4, NMFS would structure species complexes as they are outlined for alternative suites 2 and 3. Therefore, the economic impacts associated with species complexes would be the same as described in alternative suite 2. The associated economic impacts of the quota reductions for sandbar sharks and non-sandbar LCS and the division of those quotas among vessels inside and outside of a research fishery are described in the next section in combination with retention limits.

4.4.10 Quotas and Retention Limits

Alternative suite 4 would establish shark research fishery for sandbar sharks. Only incidental or directed permit holder that apply and are selected to participate in this program could land sandbar sharks. Vessels not participating in the research program would still be able to land non-sandbar LCS, SCS, and pelagic sharks subject to the retention limits described in Chapter 2 and Appendix A (Tables 2.1 and A.5). Based on the limited number of vessels that could fish for sandbar sharks under a research fishery, most current directed and incidental permit holders would not be allowed to land sandbar sharks, resulting in significant negative socioeconomic impacts for these permit holders. In addition, given the reduced non-sandbar LCS trip limit for vessels outside the research fishery and since directed permit holders presumably make a greater percentage of their gross revenues from shark landings, it is anticipated that there would be negative socioeconomic impacts on directed permit holders outside the research fishery compared to incidental permit holders. Since Florida, New Jersey, North Carolina, and Louisiana have the most directed and incidental shark incidental permit holders, it is anticipated that these states would have the largest negative socioeconomic impacts by the reduced non-sandbar LCS retention limits (Table 3.32). As with alternative suites 2 and 3, shark dealers could also experience negative impacts due to the reduction in the sandbar and other LCS quotas and retention limits, which would reduce the overall amount of sharks being landed.

As with alternative suites 2 and 3, NMFS would also maintain the 60 mt ww (43.2 mt dw) shark display and research quota under alternative suite 3. Therefore, the socioeconomic impacts associated with the 60 mt ww shark display and research quota would be the same as described for alternative suites 2 and 3.

Fishery level impacts

Under alternative suite 4, the commercial quotas would be reduced to 116.6 mt dw for sandbar sharks and 541.2 mt dw for non-sandbar LCS; however, these quotas would be divided among vessels operating within a small research fishery and vessels operating outside the research fishery. All of the 116.6 mt dw (257,056 lb dw) quota for sandbar sharks would be allocated to the vessels operating in the research fishery. In addition, it is anticipated that 50 mt dw (110,230 lb dw) of the non-sandbar LCS quota would be caught while fishermen fulfilled the 116.6 mt dw of sandbar quota in the research fishery (see Section 4.4.2 and Appendix A, Table A.5). Therefore, in 2006 ex-vessel prices, it is estimated that vessels operating in the research fishery could make \$490,411 in gross revenues of sandbar and non-sandbar LCS landings (Table 4.16). Since 5 to 10 vessels are anticipated to participate in the research fishery, it is estimated that a vessel could make between \$98,082 (*i.e.*, 5 boats) to \$49,041 (*i.e.*, 10 boats) in gross revenues on sandbar shark and non-sandbar LCS landings.

Table 4.16 Gross revenues under alternative suite 4.

Alternative Suite 5	mt dw	lb dw	2006 Ex-Vessel Price	Total Gross Revenues	% Reduction from Status Quo
<i>Vessels in the research fishery</i>					
Sandbar shark	116.6	257,056			
Non-sandbar LCS	50	110,230			
Sandbar shark fins		12,853	\$18.84	\$242,147	
Sandbar shark carcass		244,204	\$0.39	\$95,239	
Non-sandbar LCS fins		5,512	\$18.84	\$103,837	
Non-sandbar LCS carcass		104,719	\$0.47	\$49,218	
Total revenues from sandbar and non-sandbar LCS landings				\$490,441	
Total revenues from sharks per trip				\$5,331	
<i>Vessels outside the research fishery</i>					
Non-sandbar LCS	491	1,082,459			
Non-sandbar LCS fins		54,123	\$18.84	\$1,019,676	
Non-sandbar LCS carcass		1,028,336	\$0.47	\$483,318	
Total revenues from non-sandbar LCS landings				\$1,502,994	
Total revenues from sharks per trip (total revenues / 1,460 trips)				\$1,365	
Total revenues under alternative suite 4 from sandbar and non-sandbar LCS landings				\$1,993,435	↓48%

Gross revenues of sandbar sharks and non-sandbar LCS by directed and incidental permit holders under status quo				\$3,824,589	
---	--	--	--	-------------	--

Vessels operating outside of the research fishery would have an estimated 491 mt dw (1,082,459 lb dw) of non-sandbar LCS quota available to them depending on non-sandbar LCS landings in the shark research fishery (see Section 4.4.2). In 2006 ex-vessel prices, this is equivalent to \$1,502,994 in gross revenues (Table 4.16). In total, vessels operating within, and outside, of the research fishery are expected to have gross revenues of \$1,993,435 in sandbar and non-sandbar LCS landings (Table 4.16). This is a 48-percent reduction in gross revenues from sandbar sharks and non-sandbar LCS under the status quo (gross revenues based on current directed and incidental permit holders' landings were \$3,824,589; Table 4.9). This is less of a reduction compared to alternative suite 2 and 3 because the entire sandbar and non-sandbar LCS quotas could be harvested under alternative suite 4. Because the states of Florida, Louisiana, New Jersey, and North Carolina have the most incidental and direct shark permit holders (Table 3.32), it is anticipated that these states would have the largest negative socioeconomic impact by these reductions in quotas of different shark species.

As with alternative suites 2 and 3, porbeagle sharks would be placed on the prohibited list under alternative suite 4. Based on the average porbeagle shark landings from 2002 to 2004 (1.5 mt dw or 3,402 lb dw) and 2006 ex-vessel prices, this is equivalent to a \$6,081 gross revenues loss in porbeagle shark landings under alternative suite 3 (Table 4.9).

In alternative suite 4, under and overharvests would be applied to the next season as described for alternative suite 2. Therefore, it is anticipated that the socioeconomic impacts of the application of under and overharvests would be the same as described for alternatives suites 2 and 3. In addition, alternative suite 4 would require that shark fins remain on the shark through the first port of landings. As with alternative suites 2 and 3, the overall socioeconomic impact of this could be significant given the reduction in the sandbar quota, which is the most lucrative shark due to the value of its fins. Therefore, the socioeconomic impacts associated with landing sharks with their fins on would be the same as described for alternative suite 2.

Directed and Incidental permit holder impacts in the research fishery

Currently directed permit holders have a 4,000 lb dw LCS trip limit. Vessels operating within a shark research fishery may experience similar trip limits, depending on the research objectives of the fishery. However, the overall quota for sandbar sharks in the research fishery would be reduced to 116.6 mt dw. Assuming the catch composition is 70 percent sandbar sharks, and there is a 4,000 lb dw trip limit, 92 trips would fulfill the sandbar shark quota (see Section 4.4.2 and Appendix A, Table A.2). Given this catch composition, 30 percent of 4,000 lb dw trip would be non-sandbar LCS. If 92 trips were made with these trip limits and catch compositions, it is estimated that 50 mt dw of non-sandbar LCS would also be caught in the research fishery (see Section 4.4.2 and Appendix A, Table A.5). Based on these landings, the research fishery would have estimated overall gross revenues of \$490,411 or \$5,331 per trip in gross revenues (assuming these are BLL trips; Table 4.16). On average, directed permit holders

reported 1,108 trips per year (using a combination of gear types) in the Coastal Fisheries and HMS logbooks that landed sandbar sharks and non-sandbar LCS from 2003 to 2005 (Table 4.11). While 92 trips represents a greater than 90 percent reduction in the average number of trips taken by directed permit holders from 2003 to 2005, these trips would be divided across a much smaller universe of vessels, therefore, minimizing the economic impacts for vessels that are selected to participate in the research fishery. Since Florida, New Jersey, North Carolina, and Louisiana have the most directed shark incidental permit holders, it is anticipated that these states would have the largest negative socioeconomic impacts given the limitation of only a few vessels inside the research fishery being able to maintain higher trip limits than those vessels operating outside the research fishery.

Incidental permit holders took, on average, 305 trips per year that landed sandbar sharks and 347 trips per year that landed non-sandbar LCS in 2003 to 2005 (Table 4.11). On average, they landed 2 sandbars and 3 non-sandbar LCS per trip for total estimated gross revenues of \$248 per trip (Table 4.11). However, under alternative suite 4, incidental fishermen would have the same retention limits as directed shark permit holders, and therefore, receive the same gross revenues from shark landings as directed shark permit holders. Given gross revenues for directed shark permit holders would be \$5,331 per trip under alternative suite 4, the same gross revenues for incidental permit holders would be almost 21 times higher than gross revenues under the status quo ($\$5,331/\$248 = 21.4$ times higher). Therefore, positive economic impacts may be realized by the few incidental permit holders that may participate in the research fishery.

Directed and Incidental permit holders outside the research fishery

Directed and incidental permit holders operating outside the research fishery would still be able to retain 22 non-sandbar LCS per trip until the remaining 491 mt dw non-sandbar LCS quota is filled. Based on 2006 ex-vessel prices, this quota could result in gross revenues of \$1,502,994 (Table 4.16). Given the 22 LCS trip limit (741.4 lb dw non-sandbar LCS per trip) and the 491 mt dw (1,082,459 lb dw) of non-sandbar LCS quota, approximately 1,460 trips (1,082,459 lb dw / 741.4 lb dw per trip) could be made by directed and incidental permit holders to fulfill the non-sandbar LCS quota. This is equivalent to approximately \$1,365 per trip in non-sandbar LCS gross revenues (Table 4.16).

On average, directed permit holders made 1,108 trips that landed non-sandbar LCS from 2003 to 2005 resulting in gross revenues of \$1,497 per trip in non-sandbar LCS landings (Table 4.11). Therefore, directed permit holders operating outside of the research fishery could take an 8-percent reduction in gross revenues per trip for non-sandbar LCS landings ($\$1,497 - \$1,365 = \$132$; $\$132/\$1,497 = 8$ -percent reduction). In addition, on a trip basis, directed permit holders made approximately \$1,860 in gross revenues from sandbar sharks (Table 4.11). Therefore, directed permit holders could lose \$1,993 in combined gross revenues earned from non-sandbar LCS and sandbar shark landings per trip ($\$1,497 + \$1,860 = \$3,357$; $\$3,357 - \$1,365 = \$1,992$; Table 4.11), which is a 59-percent reduction in gross revenues per trip ($\$1,992/\$3,357 = 59$ reduction) for directed permit holders operating outside of the research fishery compared to the status quo. Since an average of 141 vessels with directed shark permits reported sandbar landings in the Coastal Fisheries and HMS Logbooks from 2003 to 2005 and most directed permit holders are located in Florida, New Jersey, and North Carolina (Table 3.32), it is

anticipated that these 141 active vessels in these states would be most negatively impacted by alternative suite 4.

On average, incidental permit holders made 347 trips per year that landed an average of 3 non-sandbar LCS per trip from 2003 to 2005. This resulted in average gross revenues of \$141 per trip in non-sandbar LCS landings (Table 4.11). However, under alternative suite 4, incidental permit holders operating outside of the research fishery could retain 22 non-sandbar LCS per trip, resulting in \$1,365 per trip in non-sandbar LCS gross revenues. This would be an increase in gross revenues of almost 10 times the trip average under the status quo ($\$1,365 \text{ per trip} / \$141 \text{ per trip} = 9.6$). However, incidental permit holders outside the research fishery would not be able to land sandbar sharks, equating to a \$25,024 loss in gross revenues from sandbar landings for incidental permit holders (Table 4.9). Therefore, the lost revenues in sandbar landings could be offset by the 10 fold increase in gross revenues from non-sandbar LCS landings on a trip basis. For instance, if fishing effort by incidental permit holders stayed constant (*i.e.*, 347 trips), and the gross revenues of \$1,365 per trip were realized by incidental permit holders, this would equate to \$473,655 in gross revenues from non-sandbar LCS by incidental permit holders ($347 \text{ trips} \times \$1,365/\text{trip} = \$473,655$). A loss of \$25,024 in gross revenues from sandbar landings makes the incidental fishery's net gross revenues in non-sandbar LCS landings equal to \$448,631 ($\$473,655 - \$25,024 = \$448,631$). Given the total gross revenues for sandbar and non-sandbar LCS landings was \$80,558 under the status quo (Table 4.9), incidental permit holders operating outside of the research fishery could still increase their gross revenues by almost 6 times under alternative suite 4 compared to the status quo. Since most incidental shark permit holders are in the states of Florida, Louisiana, New Jersey, and North Carolina (Table 3.32), these states would benefit the most from this increase in gross revenues.

4.4.11 Time/Area Closures

Under alternative suite 4, NMFS would maintain the mid-Atlantic shark closed area to BLL gear and the current BLL closures in the Caribbean that were implemented in February 2007, (72 FR 5633). Therefore, the economic impacts associated with these closures would be the same as described under alternative suite 1. In addition, NMFS would also implement the SAFMC's MPAs as described under alternative suite 2. Therefore, the economic impacts associated with the MPAs would be the same as described in alternative suite 2.

4.4.12 Reporting

This alternative suite could result in neutral economic impacts, similar to alternative suite 3. Shark dealers would still be required to submit landings data twice a month, however, they would need to ensure that it is actually *received* by the Agency within 10 days of a bimonthly reporting period ending. Currently, shark dealers simply have to ensure that the landings reports submitted to NMFS are *post-marked* within 10 days of the end of a reporting period. Additional burden is not expected as a result of modifying the regulations to ensure that dealer reports are actually received. Furthermore, timelier reporting and receipt of information by the Agency may result in a decreased likelihood that quotas would be exceeded and overharvests removed from forthcoming shark seasons.

This alternative suite would increase the level of observer coverage for a limited number of vessels that would apply and be selected for participation in a shark research program. One-hundred percent observer coverage would be a requirement for consideration under this program. Vessels outside the shark research program would still be required to take an observer if selected. All vessels would still be required to complete and submit commercial logbooks in the same timeframe.

As described in alternative suites 2 and 3, this suite would change how sharks listed as unclassified on shark dealer reports are accounted for under quota monitoring. Unclassified sharks would be counted as sandbar sharks, and not as LCS, which is the current procedure under quota monitoring. Properly identifying sharks would result in negative economic impacts in the short-term because it takes more time. Submission of accurate shark dealer data may result in positive economic impacts in the long-term as it would improve quota monitoring, decrease the likelihood of extensive overharvests and subsequent closures, and improve the results from stock assessments by ensuring data is more accurate and includes species specific information.

4.4.13 Seasons

The same negative economic impacts for the North Atlantic region described in alternative suites 2 and 3 would exist for alternative suite 4. Furthermore, seasons would be closed within five days notice of any species/complex attaining 80 percent of their quota. The primary difference between alternative suite 4 and the other alternatives would be that there would be a limited number of vessels that would be selected to participate in a shark research program, and would be able to land sandbar, non-sandbar LCS, and other species/complex year-round if quota was available. As described in alternative suites 2 and 3, seasons for sandbar and non-sandbar LCS would both be closed with five days notice if either achieves 80 percent of their respective species/complex quota. This could result in negative economic impacts as it would limit the number of trips that may be scheduled for all vessels.

4.4.14 Regions

As stated in alternative suites 2 and 3, eliminating regions would likely have negative economic impacts on regions that do not have sharks present year round. The North Atlantic region would be disadvantaged as a result of reverting back to one region, versus three under the status quo, as they would not have a secure regional trimester quota which increased the likelihood that they would have a shark fishery when sharks are present in the summer months. However, this alternative suite would implement a shark research program that would allow a limited number of vessels to conduct fishing activities in all regions throughout the year. Vessels outside the research fishery could either move to southern areas to participate in the shark fishery in areas where sharks are present year-round or redistribute fishing effort to other fisheries. Dealers in the North Atlantic region would most likely be negatively affected, possibly even more so than vessels, as the likelihood of consistently having shark products would decrease.

4.4.15 Recreational Measures

As described under alternative suites 2 and 3, participants in recreational shark fisheries would experience negative economic impacts as a result of reducing the number of sharks that

could be legally landed (Table 4.8). Therefore, the socioeconomic impacts associated with the recreational measures under alternative suite 4 would be the same as outlined for alternative suites 2 and 3.

Conclusion

This alternative suite is preferred at this time because it implements quotas and retention limits necessary to rebuild and stop overfishing of several shark species; it maximizes scientific data collection by implementing a limited research fishery for sandbar sharks to continue with 100 percent observer coverage; and mitigates some of the significant economic impacts that are necessary and expected under all alternative suites to reduce fishing mortality as prescribed by recent stock assessments. This alternative suite strikes a balance between positive ecological impacts that must be achieved to rebuild and stop overfishing on depleted stocks while minimizing the severity of negative economic impacts that would occur as a result of these measures. By allowing a limited number of historical participants to continue to harvest sharks, the Agency ensures that data for stock assessments and life history samples would continue to be collected. This would also allow a small pool of individuals to continue to collect revenues from sharks as they have in the past. Individuals not selected to participate in the shark research program could still land 22 non-sandbar LCS per vessel per trip, which would limit the number of trips targeting non-sandbar LCS sharks, however, would still afford the opportunity to keep some sharks that are landed incidentally, preventing excessive discards.

However, some negative economic impacts may still occur under alternative suite 4. For instance, fishermen outside the research fishery would not be able to land sandbar sharks and would be subject to a limited non-sandbar LCS quota, resulting in 48-percent reduction in gross revenues compared to the status quo (Table 4.16). These losses in gross revenues may be exacerbated by the requirement to land shark with their fins attached. In addition, eliminating regions and seasons represents an economic disadvantage to the North Atlantic region as sharks are not present in these waters year-round, meaning the quota may be filled in some years before sharks are present in these areas. The elimination of seasons and regions combined with limiting underharvest carry-overs may have negative economic impacts on fishermen, especially for regions that consistently had underharvests of species like SCS. However, incidental permit holders would have higher retention limits of sandbar and non-sandbar LCS inside the research fishery as well as they would experience higher retention limits of non-sandbar LCS outside the research fishery. Therefore, they might experience positive economic benefits under alternative suite 4.

Since only a few vessels would be participating in the research fishery, interactions with protected resources may decrease as a result of less BLL and gillnet fishing effort targeting sharks. However, it is assumed that some of this fishing effort may be displaced to other gillnet and BLL fisheries in which participants are permitted, which may interact with protected resources. In addition, alternative suite 4 would require that sharks be landed with their fins still attached; this requirement could prevent fishermen from keeping the fins from sharks that are not landed, resulting in a reduction of overall shark mortality.

Sandbar landings within the research fishery would be monitored by shark observer reports. These reports would be submitted at the conclusion of a fishing trip; therefore allowing

near real-time quota monitoring of the sandbar quota as well as other species of sharks landed in the shark fishery. This is especially critical for the 116.6 mt dw sandbar quota. Non-sandbar LCS, SCS and pelagic sharks caught outside would be monitored by biweekly dealer reports. Given the reduced trip limit for non-sandbar LCS, if dealer reports are submitted on a timely basis, then NMFS anticipates quota monitoring would be improved, reducing the likelihood of overharvests. This would be economically beneficial to fishermen as well as ecologically beneficial to the shark stocks.

4.5 Alternative Suite 5: Close Atlantic Shark Fisheries

Ecological Impacts

4.5.1 Quotas, Species Complexes and Retention Limits

This alternative suite would prohibit the landing of all sharks in commercial and recreational fisheries. This alternative suite could have positive ecological impacts for sandbar sharks. The 2005/2006 stock assessment for sandbar sharks recommends a total allowable catch of 220 mt ww (158.3 mt dw) per year to rebuild the stock by 2070. A quota of 0 mt dw would expedite the time necessary for rebuilding sandbar sharks stocks. However, even if landings of sandbar sharks were prohibited in Federal waters, there would still continue to be dead discards, illegal landings, and landings in state waters that must be accounted for. Based on landings reported in the Coastal Fisheries Logbook, landings and discards in the HMS Logbook, and discards reported in by the BLL observer program (Hale and Carlson, 2007), it is estimated that there would continue to be approximately 39.7 mt dw per year of sandbar sharks landed in state waters, landed illegally or discarded dead in recreational and commercial fisheries (Table 4.1 plus 27 mt dw due to potential recreational landings). This level of fishing mortality represents a decrease of 118.3 mt dw compared to the fishing mortality level recommended by the sandbar shark stock assessment and could have positive ecological impacts on a species that is overfished and experiencing overfishing. Compared to current fishing mortality levels, implementing this alternative suite could result in a decrease in total landings and discards of sandbar sharks of approximately 86 percent by number of sharks or 95 percent by weight (assuming mean commercial sandbar weight = 40.5 lb dw; Cortés and Neer, 2005).

Dusky sharks have been a prohibited species since 2000, however, they continue to be landed and/or discarded in longline, gillnet, and recreational fisheries pursuing sharks and other species. This alternative suite could have positive ecological impacts as it would prohibit landings of all shark species. Presumably, this could reduce fishing effort for all sharks in longline, gillnet, and recreational fisheries. Closing Atlantic shark fisheries could reduce the number of dusky sharks that are caught as bycatch and then discarded dead, however, it would not likely affect the number of dusky sharks that are landed illegally by commercial or recreational participants or dusky sharks landed in state waters. Approximately 8.1 mt dw of dusky sharks would likely continue to be landed in state waters, landed illegally or discarded dead in commercial and recreational fisheries (Table 4.1). This represents a 75-percent reduction in weight (34 percent by number) of dusky sharks that are currently being landed or discarded.

Closing the Atlantic shark fisheries could result in positive ecological impacts for other species in the LCS complex (non-sandbar LCS than sandbar sharks). In 2005/2006, stock

assessments for the LCS complex (including sandbar sharks) and blacktip sharks in the Gulf of Mexico and South Atlantic were conducted. The results of these assessments indicate that it is not appropriate to assess the species included in the LCS complex as a group, so the LCS complex status was declared to be unknown. Blacktip sharks in the Gulf of Mexico are healthy, whereas, in the South Atlantic they are unknown. The stock assessment for blacktip shark recommended maintaining current fishing mortality levels in the Gulf of Mexico region and not increasing landings in the South Atlantic region. Most of the species that comprise the LCS complex, with the exception of sandbar and blacktip sharks, have limited landings data available and/or are not encountered frequently in commercial fisheries or fisheries surveys. There are limited landings data available for these species but life history studies indicate that these species generally mature later, and have fewer pups, than other sharks landed in commercial and recreational fisheries. Closing the Atlantic shark fisheries would minimize but not eliminate landings of non-sandbar LCS as these species would still be caught illegally, discarded dead, or landed in state waters. It is estimated that 51.7 mt dw per year of non-sandbar LCS sharks would continue to be discarded or landed in state waters (Table 4.1). This represents a 66-percent reduction in landings of non-sandbar LCS, resulting in positive ecological impacts.

This alternative suite would also close the fishery for SCS to further reduce fishing effort and assist in rebuilding of overfished shark species that could be caught when targeting SCS. The ecological impacts of closing the SCS fishery could likely be positive for the SCS complex. The SCS complex, and individual species comprising the complex, are currently being assessed following the SEDAR methodology. Preliminary results from the assessment workshop indicate that blacknose sharks are overfished and experiencing overfishing. Finetooth, bonnethead, Atlantic sharpnose sharks, and the SCS complex are not overfished or experiencing overfishing. The Agency may take additional measures, as necessary, once results of the stock assessment are reviewed and final determinations are made. On average, recreational SCS fisheries landed 306.4 mt dw per year between 2003-2005. Commercial fisheries landed approximately 250 mt dw per year during the same time period. The majority of commercially landed SCS are caught with gillnet gear. Minimizing gillnet fishing effort may also result in positive ecological impacts for species that are caught incidentally in these fisheries. However, illegal landings of SCS, dead discards, and landings in state waters would continue to occur, despite closing the SCS fishery.

In addition, this alternative suite would close the fishery for pelagic sharks and could likely result in positive impacts for pelagic sharks. As described in Chapter 3, stock assessments have been conducted for blue, shortfin mako, and porbeagle sharks. Stock assessments for blue and shortfin mako shark stocks conducted by the Standing Committee on Research and Statistics (SCRS) of ICCAT in 2005, indicated that results of both these assessments should be considered preliminary due to limitations on quality and quantity of catch data available. These species will be assessed again in 2008 by the SCRS. The stock assessment for porbeagle sharks, conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), indicates that porbeagle are overfished but are not experiencing overfishing. The estimated rebuilding time frame is 100 years. NMFS has reviewed the Canadian stock assessment and deemed it to be the best available science and appropriate for management in U.S. waters. There were 4,700 pelagic sharks landed per year in recreational fisheries from 2002 to 2004. During the same time period, commercial fisheries landed 587,925 pelagic sharks per year (266 mt dw). The commercial fishery landed an average of 1.54 mt dw per year of porbeagles from 2002-2004. Dead discards

and illegal landings of pelagic sharks would continue to occur if landings are prohibited; however, the Agency assumes that these levels of fishing mortality would be significantly less than current levels.

Ecological impacts for prohibited shark species are expected to be positive, despite the fact that it is already illegal to land these sharks. As described above, drastic reductions in fishing effort as a result of closing the Atlantic shark fishery would result in less effort targeting sharks. Reductions in longline and gillnet effort targeting sharks are expected to reduce bycatch and discards of prohibited sharks.

This alternative suite would partition the 60 mt ww quota for exempted fishing permits, display permits, scientific research permits, and letters of acknowledgement to place more stringent limits on the quantity of sandbar and dusky sharks authorized for these purposes. However, the overall 60 mt ww quota would not be modified. This quota represents less than five percent of the current commercial quota. Maintaining this quota could result in neutral ecological impacts because the quota has never been met in the past, and the Agency could strictly regulate the number and species of sharks authorized for exempted fishing and public display. Reducing the amount of dusky and sandbar sharks authorized for these purposes could result in neutral or slightly positive ecological impacts for these species. The sandbar sharks harvested under this program have ranged from 57 to 110 sharks per year from 2004 to 2006. Ecological impacts on other species would be neutral. The sandbar shark quota authorized for research and public display would be limited to 2 mt dw (1 mt dw for research, 1 mt dw for display). Dusky sharks would not be allowed for public display due to concerns regarding their stock status and their performance in captivity. However, based on research needs and objectives, NMFS would review the allocation of dusky sharks for research on a case by case basis. The remaining quota for exempted fishing permits (41.2 mt dw or 57.2 mt ww) would be authorized for all other shark species, besides dusky and sandbar sharks, under the exempted fishing program.

Closing Atlantic shark fisheries would likely have positive impacts on non-shark species that are incidentally landed with gillnet and BLL gear used to target sharks. Vessels targeting sharks with BLL gear in the Gulf of Mexico effectively target sharks, as observer reports from 2005-2006 indicate that sharks comprise 92 percent of the total catch, however, there are other species that are caught while targeting sharks. Some of these species include: grouper, king snake eel, red drum, and snapper (various spp.). In the South Atlantic region, sharks comprised a majority (95 percent) of the total catch, however; grouper, snapper, cownose ray, smooth dogfish, mutton snapper, and spiny dogfish, were also caught by vessels targeting sharks. Closing the Atlantic shark fishery would significantly reduce shark fishing effort with BLL gear, resulting in positive ecological impacts to some of the species that are landed incidentally by shark fishermen deploying BLL gear. Similar to BLL fisheries targeting sharks, observer reports from the gillnet fishery indicate that there are non-shark species caught with this gear by fishermen targeting sharks.

Observer reports from the gillnet fishery between 2004 and 2005 indicate that non-shark bycatch varies considerably depending on how gillnets are fished. Strike gillnets catch 99 percent sharks, drift gillnets catch 71 percent sharks, and sink gillnets catch 82 percent sharks.

Non-shark species commonly caught in drift and sink gillnet gear includes: little tunny, king and Spanish mackerel, great barracuda, cobia, southern kingfish, guitarfish, sailfish, and gulf flounder. Significant reductions in directed shark gillnet fishing effort as a result of closing shark fisheries could likely result in positive ecological impacts for these species.

Some of the positive ecological impacts that closing the Atlantic shark fishery on other non-shark species may be mitigated by the fact that displaced shark fishermen would likely transfer fishing effort to other BLL and gillnet fisheries. It is difficult to predict exactly which fisheries would receive the majority of the fishing effort that is redistributed to other fisheries by closing the shark fishery. Currently, the majority of shark fishing effort takes place in the Gulf of Mexico and South Atlantic regions. Judging by the other permits that shark directed and incidental fishermen possess, it seems likely that effort would likely increase in several other managed-fisheries in the South Atlantic and Gulf of Mexico regions, including: snapper grouper, reef fish, tilefish, Spanish mackerel, King mackerel, and dolphin/ wahoo. These affects are discussed in more detail in under the cumulative impacts section in Section 4.14.

4.5.2 Time/Area Closures

The existing seasonal BLL closures affecting the Atlantic shark fishery would no longer be necessary as this alternative suite closes the Atlantic shark fishery and would no longer allow the use of BLL gear by shark permit holders. In isolation, removing the time/area closures could have neutral ecological impacts on sharks and incidentally landed species as the shark fishery would no longer exist. Currently, NMFS prohibits gillnet fishing or gillnet possession during annual restricted periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. An exemption to the possession prohibition is provided for transiting through the area if gear is stowed in accordance with this final rule. The southeast U.S. restricted area would be expanded north to approximately the border between North and South Carolina and divided into two regions, north and south. North of 29 N, the restricted period would be from Nov. 15- April 15. South of 29 N latitude the restricted area would be in effect from Dec. 1 through March 31 of each year. Positive ecological impacts for right whales, protected resources, and other bycatch could likely occur as a result of maintaining these closures.

4.5.3 Reporting

This alternative suite would have neutral ecological impacts concerning reporting. Shark dealer reports would no longer be submitted by dealers twice a month as they would no longer be allowed to purchase sharks. Commercial fishermen with Federal HMS permits would still be required to submit landings data via logbooks within seven days of offloading, however, this data would not include any information concerning sharks as they would no longer be landed. Currently, 20 percent of fishermen whom submit data via the Coastal Fisheries Logbook are selected to provide information on any discards that occurred during the fishing trip. The percentage selected would be increased to improve monitoring of sharks that are likely to be landed and discarded in other BLL and gillnet fisheries so that this information could be incorporated into stock assessments in the future. The need to take an observer on directed shark trips would no longer be necessary as this alternative suite would close the Atlantic shark fishery. Furthermore, the Agency would lose a critical source of fisheries dependant information from the

BLL and gillnet fisheries as a result of this alternative suite. Closing the Atlantic shark fishery would negate the need to have observer programs for the BLL and gillnet fisheries. Because information attained from these programs is used to monitor protected resource interactions, gather biological samples, conduct stock assessments, and better understand shark fishing practices, this alternative suite is currently not preferred. .

4.5.4 Seasons

Seasons for the commercial Atlantic shark fishery would no longer apply as this alternative suite would close the fishery.

4.5.5 Regions

Regions for the commercial Atlantic shark fishery would no longer apply as this alternative suite would close the fishery.

4.5.6 Recreational Measures

Closing the recreational fishery for Atlantic sharks would have positive ecological impacts because recreational landings of sharks would decrease significantly. The level of recreational fishing effort and landings vary by shark species. The most commonly landed species include: blacktip, sandbar, spinner, bull, lemon, nurse, shortfin mako, Atlantic sharpnose, bonnethead, and blacknose sharks. Tables 3.23 to 3.26 show the landings for various shark species from 1998-2005. There would likely be some level of fishing mortality in recreational fisheries despite prohibiting landings of sharks as a result of post-release mortality and/or sharks that are landed illegally. However, it is assumed that landings would decrease dramatically, especially since it would alleviate the need for fishermen to positively identify sharks before determining whether or not the species could be landed. Rather, all Atlantic sharks (except for spiny dogfish which are managed by NEFMC and MAFMC) would be prohibited from retention. Directed outreach efforts focusing on the recreational fishing community may help to improve understanding of, and compliance with, shark fishing regulations.

4.5.7 Protected Resources and EFH

Prohibiting use of BLL gear would have positive ecological impacts on protected resources, including: sea turtles, smalltooth sawfish, and marine mammals. From 1994-2006, the BLL shark fishery caught 74 sea turtles (6 leatherback, 59 loggerheads, and 9 other sea turtles). Fourteen smalltooth sawfish and four delphinids were also observed caught in the BLL fishery during the same time period. Interactions with BLL gear and protected resources in fisheries targeting sharks would likely decrease as a result of this alternative suite. Bottom longline effort would still remain, and possibly increase, in other fisheries that target other species with BLL, including: snapper grouper, reef fish, and tilefish. However, those fisheries are subject to different Biological Opinions and Incidental Take Statements than the shark fishery.

Closing the shark gillnet fishery would have positive ecological impacts for protected resources. Between 1994 through 2006, 12 sea turtles were observed; 11 loggerheads, and 1 leatherback. There has been one smalltooth sawfish observed in the gillnet fishery which

occurred in 2003. From 1999 – 2004, observed takes in the gillnet fishery of marine mammals totaled 12 bottlenose dolphins and four spotted dolphins.

Closing all Atlantic shark fisheries would have positive ecological impacts for essential fish habitat because the primary gear deployed in the commercial shark fishery is BLL gear. This gear type may have potentially adverse effects on HMS and non-HMS EFH. Bottom longlines principally target large coastal sharks in the EEZ between Texas and Maine. Typically they are placed in sandy and muddy bottom habitats where expected impacts would be minimal to low (Barnette, 2001). The 1999 NMFS EFH Workshop categorized the impact of BLL gear on mud, sand, and hard-bottom as low (Barnette, 2001). Bottom longline may have some negative impact if gear is set in more complex habitats, such as hardbottom or coral reefs in the Caribbean or areas with gorgonians, or soft corals and sponges in the Gulf of Mexico (Barnette, 2001, NREFHSC, 2002; Morgan and Chuenpagdee, 2003). Bottom longline set with cable groundline or heavy monofilament with weights could damage hard or soft corals and potentially become entangled in coral reefs upon retrieval, resulting in coral breakage due to line entanglement. However, the extent to which BLL gear is fished in areas with coral reef habitat has not been determined. This gear type is similar to that employed in fisheries targeting reef fish in the Gulf of Mexico and South Atlantic regions.

Bottom longline gear may have a detrimental effect on non-HMS EFH if it is placed in coral reefs, hard bottom, or SAV habitats. Bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts. However, this alternative would close shark fisheries and it is expected that participants would transfer effort to other BLL fisheries targeting reef fish, and snapper grouper, which are found at different depths and over different bottom types, which may have negative ecological impacts on non-HMS EFH.

Social and Economic Impacts

4.5.8 Quotas, Species Complexes, and Retention limits

Alternative Suite 5 would have significant economic and social impacts on a variety of small entities, including: commercial shark permit holders, shark dealers, and other secondary industries dependent on the shark fishery such as gear manufacturers, bait and ice suppliers. The level of economic impact would be directly proportional to the amount of revenues that each entity has realized from past participation in the shark fishery. Permit holders would be impacted differently depending on the quantity of sharks landed in the past. Vessels targeting sharks (directed permit holders) landed an annual average of 1,262 mt dw of LCS, 184.5 mt dw SCS, and 29.84 mt dw pelagic sharks per year between 2003-2005. The gross revenues based on 2006 ex-vessel prices of these landings are estimated at \$3,877,003, \$593,853, and \$117,920 for LCS, SCS, and pelagic sharks, respectively, based on price information provided in Table 3.42. While it is assumed that few directed shark permit holders subsist entirely on revenues attained from the shark fishery, impacts would still be severe for those participants that depend on any income from participating in the directed shark fishery at certain times of the year. Because of the extensive economic impacts to shark directed permit holders as a result of this alternative suite, it is assumed that directed permit holders would likely pursue one of the following options as a result of closing the Atlantic shark fishery: (1) transfer fishing effort to other fisheries for

which they are already permitted (snapper grouper, king and Spanish mackerel, tilefish, lobster, dolphin/wahoo, etc), (2) acquire the necessary permits to participate in other fisheries (both open access and/or limited access fisheries), or (3) relinquish all permits and leave the fishing industry. Table 3.32 displays the other permits held by directed shark permit holders as of May 2007.

Incidental permit holders would face negative economic and social impacts as a result of closing the Atlantic shark fishery, however, not as severe as directed permit holders. It is assumed that incidental permit holders receive the majority of their fishing income from participating in other fisheries depending on the region and the type of gear predominantly fished (i.e., swordfish, tunas, snapper grouper, tilefish, dolphin/wahoo, lobster, etc.). It is estimated that, on average, between 2003 to 2005 incidental permit holders landed 26.8 mt dw LCS, 15.3 mt dw SCS, and 8.11 mt dw pelagics per year. This equates in gross revenues based on 2006 ex-vessel prices for these landings of \$82,333, \$49,246, and \$32,049 for the respective species complexes. Incidental permit holders would likely have to increase effort in these other fisheries to replace lost revenues from landing sharks. Table 3.32 shows the other permits possessed by incidental shark permit holders. Furthermore, these vessels may seek other permits (open access or limited access transferred from another vessel) or leave the fishing industry entirely.

This alternative suite would also have negative economic and social impacts for shark dealers as they would no longer be authorized to purchase shark products from Federally permitted shark fishermen. Dealers would still be able to purchase shark products from state-permitted shark fishermen, depending on state-specific regulations. Shark dealers also maintain permits to purchase other regionally caught fish products. Due to the brevity of the LCS shark fishing season, which is the shark fishery that accounts for the majority of the shark product revenue due to the fin value, many dealers also get revenue from purchasing fish products other than sharks. The majority of shark dealer permit holders hold permits to purchase other fish products, including swordfish, tunas, snapper grouper, tilefish, mackerel, lobster, and dolphin/wahoo among others (Table 3.34). It is difficult to assume, on an individual dealer basis, the quantity of revenues received exclusively from shark products.

Shark fin dealers, specializing in the purchase of shark fins from Federal and state permitted dealers, would also experience negative social and economic impacts as a result of closing the shark fishery. These dealers receive virtually all of their income from purchasing shark fins and shipping them to exporters. Exporters then transport the fins to global and domestic markets. This alternative suite would likely force shark fin dealers to leave the industry or focus on purchasing other fishery products, resulting in significant economic impacts to the individuals involved in this trade.

Closing the Atlantic shark fishery would have negative economic impacts on global shark fin markets. As a result of this alternative suite, U.S. flagged vessels would no longer be able to contribute to the global demand for shark fins. This would disadvantage U.S. shark fishermen as global markets would likely need to purchase their shark fins from other markets. However, the U.S. is not a significant producer of shark products globally. Based on data from the United Nations Food and Agriculture Organization (FAO), less than one percent of global shark landings occur in the U.S. Atlantic.

It is difficult to estimate the economic and social impacts that would be experienced by various small entities that support the shark fishery, e.g., purveyors of bait, ice, fishing gear, and fishing gear manufactures. However, these impacts would likely be negative. It is difficult to estimate these impacts as it is uncertain to what extent vessels that were fishing for sharks would redistribute their fishing effort to other fisheries, or simply cease fishing operations. If the majority of vessels affected by a shark fishery closure simply displace effort to other fisheries it is assumed that they would still be dependant on small entities for their bait, ice, and gear as these are products are essential for fishing excursions targeting any species. Redistributing effort to other fisheries would mitigate negative economic impacts. However, if a significant number of vessels cease fishing operations or scale back considerably, then severe economic consequences would be imparted on these support industries as a result.

4.5.9 Time/Area Closures

Seasonal time area closures for BLL gear would no longer be applicable as a result of this alternative. Currently, NMFS prohibits gillnet fishing or gillnet possession during annual restricted periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. An exemption to the possession prohibition is provided for transiting through the area if gear is stowed in accordance with this final rule. The southeast U.S. restricted area would be expanded north to approximately the border between North and South Carolina and divided into two regions, north and south. North of 29 N, the restricted period would be from Nov. 15- April 15. South of 29 N latitude the restricted area would be in effect from Dec. 1 through March 31 of each year. Maintaining these closures would likely not result in economic or social impacts to shark gillnet fishermen.

4.5.10 Reporting

This alternative suite would increase the proportion of fishermen completing the Coastal Fisheries Logbook and the proportion of fishermen selected to report information on fish that are discarded. Increasing the number of fishermen who are selected to provide this data is not expected to have economic or social impacts. Currently, 20 percent of the fishermen completing this logbook are selected. This percentage would be increased to facilitate improved data available for shark interactions with longline and gillnet gear. This information would be especially useful because sharks could no longer be landed and the existing logbook only requires fishermen to provide data on landed fish. Shark dealers would no longer be required to submit dealer reports regarding sharks purchased. Increased reporting burden would be subject to approval under the Paperwork Reduction Act.

4.5.11 Seasons

Seasons for the commercial Atlantic shark fishery would no longer apply as this alternative suite would close the fishery.

4.5.12 Regions

Regions for the commercial Atlantic shark fishery would no longer apply as this alternative suite would close the fishery.

4.5.13 Recreational Measures

Closing the Atlantic recreational shark fishery would have negative economic and social impacts. These impacts would be most pronounced for Charter/Headboat operators whom specialize in landing sharks and operators of shark tournaments that have prize categories for landing sharks. It is difficult to estimate the number of Charter/Headboat operators that specialize in shark charters as the permit covers any participant targeting swordfish, sharks, tunas, and billfish. Many Charter/Headboat operators target a variety of species depending on client interests, weather, time of year, and oceanographic conditions. Charter/Headboat operators specializing in shark fishing charters would have to target other HMS or non-HMS species to replace revenues lost as a result of customers not being able to land sharks. However, not all customers necessarily want to land sharks. Charter/Headboat operators would still be able to catch sharks, however, all sharks regardless of species would need to be released in a manner that maximizes their chances of survival. Catering business operations to clientele interested in catch and release fishing for sharks might mitigate some of the negative economic impacts. Shark tournaments that reward prizes for landing sharks would be negatively impacted as a result of this alternative suite. There have been 79 tournaments per year that had a prize category for sharks from 2005-2006. The majority of these tournaments target pelagic sharks and are held in the North Atlantic and Gulf of Mexico regions. These tournaments would either modify their rules to only allow points/prizes for released sharks or these tournaments would cease to exist. Economic impacts on small entities such as restaurants, hotels, gear manufacturers, retail stores selling fishing supplies, and marinas in the vicinity of where these tournaments are held would also experience negative economic impacts.

HMS Angling permit holders would also experience negative impacts, despite the fact that they would still be able to catch and release sharks. Taxidermists that process anglers' catches also may be impacted if the shark fishery is closed and there is no longer a need to provide shark casts or mountings. Landings would not be permitted by any recreational anglers as a result of this alternative suite.

Conclusion

Recent stock assessments for sandbar, dusky, and porbeagle sharks indicate that these species are overfished. The primary objective of this amendment is to reduce fishing mortality for these species and allow them the opportunity to rebuild. This alternative suite would have the most significant positive ecological impacts for sharks, protected resources, and EFH of the alternative suites considered in this document. However, closing the Atlantic shark fishery would also incur the most significant economic impacts on U.S. shark fishermen, shark dealers, shark tournament operators, and others involved in supporting industries. There are numerous species of shark that are not overfished or experiencing overfishing, and therefore, do not warrant a full closure of the Atlantic shark fishery at this time. Furthermore, by closing the shark fishery, the Agency would lose a valuable source of fishery dependent data (through logbooks

and the sharks BLL observer program) that would influence the ability to conduct future shark stock assessments. Other alternative suites contained in this chapter would strike an appropriate balance between preventing overfishing and allowing overfished shark stocks to rebuild, while considering the economic needs of the shark fishing community by allowing some retention of sharks.

Alternatives Modifying the Stock Assessment and SAFE Report Schedules

The 1999 FMP established that stock assessments be conducted for each species or species group every two to three years. HMS stock assessments are crucial in order to define stock boundaries, monitor rebuilding plans, improve knowledge of stock dynamics, and incorporate additional data in a timely manner. Since 2000, there have been two stock assessments completed by NMFS for LCS (2002, 2005/2006) and one assessment completed/ and one in progress for SCS (May 2002 and 2007). Other assessments have been completed by other entities, including: SCS (August 2002 by Mote Marine Laboratory), two assessments for pelagic sharks (2004 by ICCAT), and the porbeagle assessment completed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Agency is aware of another stock assessment being conducted by the Standing Committee on Research and Statistics (SCRS) of ICCAT for shortfin mako and blue sharks in 2008.

The Agency is considering alternatives that would modify the frequency of stock assessments for sharks that are conducted by the Agency as well as the publication of the SAFE report each year. Changing the stock assessment frequency from every 2-3 years to at least every five years would continue to ensure that stock assessments are conducted using the best scientific information available. Currently, the frequency of stock assessments makes it difficult to discern whether or not management measures that are implemented as a result of past stock assessments have been effective prior to subsequent assessments. This makes it difficult to ascertain the impacts that management measures may be having on the stock based on the prior assessment. Further, the Agency has adopted the Southeast Data Assessment and Review (SEDAR) process for completing stock assessments, which requires three separate workshops, and generally requires more time to complete a stock assessment than in the past. For example, the most recent stock assessment for LCS was started in 2005 and completed in 2006, employing fisheries data through 2004. Management measures based on this assessment will be implemented in 2008 with the next assessment occurring in 2009 according to the existing stock assessment frequency guidelines. One year of management measures may not be representative of their effectiveness. Thus, results from a 2009 stock assessment may not reflect management measures made in the past, and while they may be representative of the most up-to-date stock data, they may not be representative of the best available science. Changing the stock assessment frequency to at least every five years would allow more time for current management measures to take effect and their results to be detected in the next stock assessment.

National Standard (NS) 2 of the Magnuson-Stevens Act requires that NMFS take into account the best scientific information available in developing FMPs and implementing regulations. For HMS, except sharks, NMFS relies on SCRS analyses. For sharks, NMFS uses the SEDAR process as outlined above. The guidelines for implementation of NS 2 require preparation of an annual SAFE report. The SAFE report will largely rely on SCRS assessments,

shark SEDAR stock assessments, and any new fishery information. The guidelines for the SAFE report are outlined in the 1999 FMP (see Section 3.10.2).

The 1999 FMP for Atlantic Tunas, Swordfish and Sharks stated that the HMS Management Division would publish an annual SAFE report for Atlantic tunas, swordfish, billfish, and sharks every January or February. The SAFE report follows the guidelines specified in NS 2 and are used by NMFS to develop and evaluate regulatory adjustments under the framework procedure or the FMP amendment process. This information provides the basis for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, the bycatch, and the fishery over time, and assessing the relative success of existing state and Federal fishery management programs. In addition, the SAFE report is used to update or expand previous environmental and regulatory impact documents, and ecosystem and habitat requirements, including EFH.

4.6 Alternative 6: Stock Assessments for Sharks Every 2-3 Years (Status Quo)

Rebuilding plans for sharks recommended in recent stock assessments are generally much longer in duration (*i.e.*, 100-400 years for dusky sharks, 70 years for sandbar sharks, and 100 years for porbeagle sharks) than those for other fish species because of shark life history traits. The likelihood of being able to detect if management measures have had any impact on stock status or fishing mortality when only 2-3 years have elapsed between assessments is reduced. Therefore, the Agency is proposing to increase the amount of time between shark stock assessments. These alternatives would not modify any stock assessments that are already scheduled and would not affect the frequency of stock assessments conducted for other HMS species (which are dictated by ICCAT). The timing or frequency of stock assessments completed by other management entities, governments, or Regional Fisheries Management Organizations (*i.e.*, ICCAT) would also not be affected by these proposed measures.

Ecological Impacts

Ecological impacts of conducting stock assessments every 2-3 years could be neutral. Assessments have been completed on this timeframe since the 1999 HMS FMP became effective. Since 2000, there have been two stock assessments completed by NMFS for LCS (2002, 2005/2006) and one assessment completed and one in progress for SCS (May 2002 and 2007). Other assessments have been completed by other entities, including: SCS (August 2002 by Mote Marine Laboratory), two assessments for pelagic sharks (2004 by ICCAT), and the 2005 porbeagle assessment completed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Agency is aware of another stock assessment being conducted by the Standing Committee on Research and Statistics (SCRS) of ICCAT for shortfin mako and blue sharks in 2008. The timing of stock assessments is secondary to the actual management measures that are implemented, if necessary, to address overfishing and overfished stocks as far as potential ecological impacts. For fish species with life history traits such as sharks, having relatively few offspring and reaching sexual maturity at a later age, stock status is not expected to change as drastically on a year to year basis. However, as stock assessment methodologies change it is possible that having more frequent stock assessments may increase the likelihood that scientists could avail of new, more statistically robust techniques to incorporate into models designed to estimate stock status.

Social and Economic Impacts

Economic impacts of conducting stock assessments every 2-3 years could be neutral. The timing of the stock assessments does not generally have a direct economic impact, however, measures that are necessary to prevent overfishing and/or rebuild overfished stocks generally have a negative economic impact on small entities that depend on landings sharks for their livelihood. If conducting stock assessments more frequently would continue to result in the implementation of measures that require reductions in fishing mortality to maintain consistency with National Standard 1, then negative economic impacts could occur as a result. Alternatively, if results were positive for certain shark stocks, then assessing shark populations more frequently would have positive economic impacts. As additional data become available, it is difficult to predict the results of forthcoming stock assessments and the economic ramifications of the measures that need to be implemented as a result. However, the Agency has adopted the SEDAR approach to stock assessments which encourages full participation from industry, environmentalists, academics and other parties affected by stock assessments to participate at all workshops.

4.7 Alternative 7: Stock Assessments for Sharks At Least Every 5 Years. Preferred Alternative

Ecological Impacts

Ecological impacts of conducting stock assessments could be neutral or slightly negative. Conducting stock assessments on a more frequent basis allows scientists to revisit past and current methodologies on a more frequent basis to ensure that the appropriate methods are being employed for the assessment of the stock. Generally, more frequent assessments allow managers to assess past management initiatives to ensure that they are consistent with rebuilding plans and the need to prevent overfishing, if necessary. Because of the duration of time required to complete stock assessments and the subsequent time frame to implement recommended management measures, stock assessments every two to three years may not fully reflect the implemented changes. Recent assessments for sandbar, porbeagle, and dusky sharks indicate that they are all overfished. Management measures to reduce fishing mortality that could lead to rebuilding are being implemented in this rulemaking. Since the measures being considered call for such drastic reductions in fishing mortality, quotas, and retention limits it does not seem likely that an assessment in the near future could require even more stringent measures, therefore, ecological impacts are likely neutral.

Social and Economic Impacts

Economic impacts of conducting stock assessment could be variable depending on the results of the stock assessment and management measures necessary. Scheduling stock assessments so that there is more time between assessments allows participants in shark fisheries to adapt to management measures implemented in the past. This provides participants with the opportunity to decide if, and to what degree, they may continue to stay engaged in shark fisheries. More frequent stock assessments would have positive economic impacts if information attained from assessments indicated that quota levels and fishing mortality may be increased for certain species because fishermen would be able to harvest more sharks. Furthermore,

participants may experience negative economic impacts if the results change dramatically and additional measures are needed to reduce fishing effort and mortality.

Conclusion

Alternative 7, conducting shark stock assessments by NMFS at least once every 5 years, is preferred at this time because it increases the interval between stock assessments allowing management measures enough time to be implemented and evaluated. Under the current schedule, SEDAR assessments may take up to one year, and by the time determinations are made and rulemaking is implemented to address these determinations, NMFS is already preparing for another stock assessment (assessments every 2-3 years). The Agency does not anticipate that there would be extensive negative ecological consequences as a result of having less frequent assessments because stock assessment methodologies, while dynamic, do not change drastically. In addition, while more frequent stock assessments (*i.e.*, stock assessments every 2 to 3 year) may be representative of the most up-to-date stock data, they may not be representative of the best available science. Changing the stock assessment frequency to at least every five years would allow more time for current management measures to take effect and their results to be detected in the next subsequent stock assessment. Furthermore, by following the SEDAR process, the Agency would still be able to incorporate new methods into stock assessments because all members of the scientific community and general public are invited to attend and exchange ideas. Economic impacts would be contingent upon the findings of future assessments and the management measures necessary; however, fishermen may expect some benefit from not having to be concerned with a new suite of management measures affecting them every 2-3 years as a result of new assessments for sharks.

4.8 Alternative 8: SAFE Report Published in January or February of Every Year (Status Quo)

Ecological Impacts

There are no specific ecological impacts associated with publishing the SAFE report in January or February of each year, rather this is an administrative deadline set by NMFS. As long as the SAFE report is published each year according to the guidelines of NS 2 (*i.e.*, it summarizes the best available scientific information concerning the past, present, and possible future condition of the stock, marine ecosystems, and fisheries being managed under Federal regulation) such that framework actions and the FMP amendment processes could address management issues appropriately, maintaining the publication date of January or February under the status quo would have neutral ecological impacts. In addition, recently published SAFE reports have been released later in the year.

Social and Economic Impacts

There are no negative social or economic impacts associated with NMFS publishing a safe report each year in either January or February as this deadline is mainly administration in nature. By publishing the SAFE report annually according to NS 2, framework actions and FMP amendments could base annual harvest levels from each stock, document significant trends or changes in the resource, the bycatch, and the fishery over time, and assess the relative success of

existing state and Federal fishery management program. In doing so, management actions could appropriately address the fishery to minimize negative social and economic impacts to fishermen. However, the timing of the SAFE report within the calendar year would not affect any of these issues, therefore, maintaining the status quo would result in neutral social and economic impacts.

4.9 Alternative 9: SAFE Report Published in the Fall of Every Year

Ecological Impacts

Publishing a SAFE report in the fall of every year would allow NMFS more flexibility to balance other responsibilities throughout the calendar year, as necessary. Under alternative 9, a SAFE report would still be published every year according to NS 2 to help NMFS develop and evaluate regulatory adjustments under the framework procedure or the FMP amendment process. However, as mentioned under alternative 8, the timing of the publication is administrative in nature. Therefore, allowing the SAFE report to be published in the fall (or earlier, if necessary) would have no negative ecological impacts.

Social and Economic Impacts

There are no negative social or economic impacts associated with publishing the SAFE report in the fall of every year. Publishing the SAFE report in the fall would give the Agency more discretionary time to develop a SAFE report each year according to the guidelines under NS 2. However, since a SAFE report would still be published on an annual basis, it would provide the needed information so management actions could appropriately address the fishery to minimize negative social and economic impacts to fishermen. Therefore, publishing a SAFE report each year in the fall would have neutral social and economic impacts.

Conclusion

Both alternative 8, to publish a SAFE report in January or February of each year, and alternative 9, to publish a SAFE report in the fall of each year, would have no ecological, social, or economic impacts on fishermen and related industries. However, NMFS is preferring alternative 9 to allow for more discretionary time to develop a SAFE report each year according to the guidelines under NS 2. This would give NMFS more flexibility to balance other responsibilities throughout the calendar year, while still developing a SAFE report year based on the best available science to characterize the different fisheries and marine ecosystems managed under Federal regulations. The annual SAFE report would still be used to develop and evaluate regulatory adjustments under the framework procedure or the FMP amendment process as it is currently under the status quo.

4.10 Impacts on Essential Fish Habitat

The Magnuson-Stevens Act requires NMFS to evaluate the potential adverse effects of fishing activities on EFH. If NMFS determines that fishing gears are having an adverse affect on HMS EFH, or other species' EFH, then NMFS must include management measures that minimize adverse effects to the extent practicable. At this time, there is no evidence to suggest that implementing any of the preferred alternatives suites or alternatives in this amendment

would adversely affect EFH to the extent that detrimental effects could be identified on the habitat or fisheries. Ecological impacts to EFH due to actions in this rulemaking would likely be positive as the preferred alternative suite would reduce shark BLL fishing effort as a result of reduced shark quotas. However, given the Consolidated HMS FMP gave a preliminary determination that BLL gear may be considered to have an adverse affect on EFH, and the Gulf of Mexico and Caribbean Fishery Management Council EFH FEIS's (2004) suggest that BLL gear may have an adverse effect on coral reef habitat, which serves as EFH for certain, reef fishes, NMFS will make a determination of shark BLL gear impacts on EFH in Amendment 1 to the Consolidated HMS FMP. In Amendment 1, NMFS will assess whether HMS BLL gear used primarily to target sharks is fished in coral reef areas, and if so, the intensity, extent, and frequency of such impacts, including any measures to minimize potential impacts. Based on this determination, NMFS would then take any necessary action regarding BLL gear.

4.11 Impacts on Protected Resources

NMFS does not believe that any of the proposed actions would trigger re-initiation of consultation under 50 C.F.R. 402.16. The preferred alternative suite 4 could have positive impacts on protected resources, including sea turtles, marine mammals, smalltooth sawfish, and prohibited shark species, such as dusky sharks, since it is expected to reduce overall fishing effort targeting sharks with gillnet and BLL gear. In addition, the preferred alternative suite 4 would increase the level of observer coverage on a limited number of vessels participating in a shark research program. This alternative would implement the quotas for sandbar and non-sandbar LCS, which are expected to reduce fishing effort, prevent overfishing, and rebuild overfished stocks. Such reductions are anticipated to also reduce interactions with prohibited dusky sharks by 72 percent. Retention limits for non-sandbar LCS would also be reduced significantly (22 non-sandbar LCS per vessel per trip) for vessels with shark permits outside the shark research program. While trip limits for vessels in the shark research program would be dictated by the research objectives, there would be a significant reduction in the number of trips because the quota for sandbar sharks would be drastically reduced. In addition, all of these trips would be subject to 100 percent observer coverage. Furthermore, the Agency would determine when these trips would take place throughout the year to ensure regional and seasonal sampling by scientific observers. This shark research program may also provide additional documentation and additional opportunities for data collection on interactions with protected resources via observer reports.

Shark fishermen outside of the shark research program could reduce the number, duration, and frequency of trips targeting sharks with BLL and/or gillnet gear. Furthermore, soak time might also be reduced given the reduced trip limits of 22 non-sandbar LCS per vessel per trip, which may increase post-release survival of any protected resources caught on BLL gear. Fishing effort would most likely decrease the most in the BLL fishery as this gear is the most effective gear for targeting sandbar and most LCS species. There may not be a pronounced decrease in fishing effort in the gillnet fishery as this fishery mainly targets small coastal sharks and blacktip sharks. There is the possibility that some of the current fishing effort in the BLL fishery would transfer to the gillnet fishery to target species that have more liberal retention limits (*i.e.*, SCS for directed permit holders). However, it is difficult to precisely predict how much fishing effort in longline and gillnet fisheries would change as a result of this alternative suite.

The other preferred alternatives, alternative 7, to conduct stock assessments for sharks every 5-6 years, and alternative 9, to have NMFS publish a SAFE Report in the fall of every calendar year, are not anticipated to have any significant negative ecological impacts on protected resources because they are largely administrative in nature.

4.12 Environmental Justice

Executive Order 12898 requires agencies to identify and address disproportionately high and adverse environmental effects of its regulations on the activities of minority and low-income populations. To determine whether environmental justice concerns exist, the demographics of the affected area should be examined to ascertain whether minority populations and low-income populations are present. If so, a determination must be made as to whether implementation of the alternatives may cause disproportionately high and adverse human health or environmental effects on these populations.

The communities of Dulac, Louisiana and Fort Pierce, Florida have significant populations of Native Americans and African-Americans, respectively. The 2000 Census data indicates that Native Americans made up 39 percent of the Dulac population, specifically the Houma Indians, which is not Federally recognized tribe. About 30 percent of the Dulac population was living below poverty level in 2000. In 2000, Black-Americans were about 41 percent of the Fort Pierce, Florida population with about 30 percent of the entire Fort Pierce population living below the poverty line. These two communities also have significant populations of low-income residents. In addition to Dulac and Fort Pierce, there is a diffuse Vietnamese-American population in Louisiana, actively participating in the PLL fishery, and commuting to fishing ports, but not living in “fishing communities” as defined by the Magnuson-Stevens Act and identified in Chapter 9 of this document. In reviewing the social impacts of the preferred alternatives of Amendment 2 to the Consolidated HMS FMP, none are expected to have a disproportionate impact on these minority and low-income populations. Greater information about potential social impacts of each preferred alternative suite is briefly described below with detailed information provided in earlier this Chapter. Demographic data indicate that coastal counties with fishing communities are variable in terms of social indicators like income, employment, and race and ethnic composition.

The preferred alternative suite 4, to establish as small shark research fishery, has the potential to have adverse economic and social impacts throughout the fishery. NMFS does not anticipate that these effects would fall disproportionately on minority or low-income populations. Alternative suite 4 was designed to reduce quotas and retention limits necessary to rebuild and stop overfishing of several shark species. It would also maximize scientific data collection by implementing a limited research fishery for sandbar sharks to continue with 100 percent observer coverage. In doing so, it would help mitigate some of the significant economic impacts that are necessary and expected under all alternative suites to reduce fishing mortality as prescribed by recent stock assessments. This alternative suite strikes an appropriate balance between positive ecological impacts that must be achieved to rebuild and stop overfishing on overfished stocks while minimizing the severity of negative economic impacts that would occur as a result of these measures. By allowing a limited number of historical participants to continue to harvest sharks in a manner resembling how the fishery was traditionally executed, the Agency ensures that data

for stock assessments and life history samples would continue to be collected. This would also allow a small pool of individuals to continue to collect revenues from sharks as they have in the past. Individuals not selected to participate in the shark research program could still land 22 non-sandbar LCS per vessel per trip, which would limit the number of trips targeting non-sandbar LCS sharks and prevent excessive discards. NMFS believes that while this would have negative economic and social impacts in the short-term, these measures are necessary to rebuild several shark stocks and prevent other species of sharks from becoming overfished.

The other preferred alternatives, alternative 7, to conduct stock assessments for sharks at least once every five years, and alternative 9, to have NMFS publish a SAFE Report in the fall of every calendar year, are not anticipated to have any significant negative social or economic impacts on HMS-related communities and are not anticipated to have an impact on minority or low-income population because they are largely administrative in nature.

4.13 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 1972, reauthorized 1996) requires that Federal actions be consistent to the extent practicable, with the enforceable policies of all state coastal zone management programs. NMFS has determined that the preferred alternative suites and alternatives would be implemented in a manner consistent to the maximum extent practicable with the enforceable policies of the coastal states in the Atlantic, Gulf of Mexico, and Caribbean that have Federally approved coastal zone management programs. NMFS will ask for states' concurrence with this determination during the proposed rule stage. NMFS has worked closely with states in the past and will continue to work with the states to ensure consistency between state and Federal regulations.

4.14 Cumulative Impacts

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). A cumulative impact includes the total effect on a natural resource, ecosystem, or human community due to past, present, and future activities or actions of Federal, non-Federal, public, and private entities. Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a Federal activity. The goal of this section is to describe the cumulative ecological, economic and social impacts of past, present and reasonably foreseeable future actions with regard to the management measures presented in this document. Table 4.17 describes the overall impacts anticipated from each of the alternatives considered.

Table 4.17 Comparison of alternative suites and alternatives considered. (+) denotes positive impact, (-) denotes negative impact, (0) denotes neutral impact.

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative Suite 1	Maintain the existing Atlantic commercial and recreational shark fisheries (Status Quo)	--	0	0
Alternative Suite 2	Establish a limited shark fishery for directed permit holders only	+	-	-
Alternative Suite 3	Establish a limited shark fishery for directed and incidental permit holders	+	-	-
Alternative Suite 4	<i>Establish a research shark fishery allowing a small directed LCS fishery</i>	+	-	-
Alternative Suite 5	Close all Atlantic shark fisheries	++	--	--
Alternative 6	Stock assessments for sharks every 2-3 years	0	0	0
Alternative 7	<i>Stock assessments for sharks every 5-6 years</i>	0	0	0
Alternative 8	SAFE report published in January or February of every year	0	0	0
Alternative 9	<i>SAFE report published in the fall of every year</i>	0	0	0

4.15 Past, Present, and Reasonably Foreseeable Actions

As discussed in Section 3.1, NMFS has taken a number of actions in the past in order to, among other things, rebuild overfished and prevent overfishing of Atlantic sharks. These actions have included FMPs, FMP amendments, and framework actions. The goals and objectives of these past rules are summarized in Section 3.1. NMFS is required to take similar actions in this document, and can reasonably expect to implement regulations in the future to address the management and conservation of Atlantic sharks. The need and objectives of this document are described in earlier sections, particularly Chapter 1, and are not repeated here.

Other recent actions within HMS fisheries that may affect shark fishermen both directly and indirectly include the 2007 second and third season Atlantic shark rule, which set the fishing seasons and quotas for the second and third trimesters of 2007 (72 FR 20765; April 26, 2007); a rule that suspended the circle hook requirement for billfish tournaments in 2007 (72 FR 26735; May 7, 2007); a rule modifying the dehooking requirements for bottom longline fishermen (72 FR 5633; February 7, 2007); a swordfish rule that allows the swordfish fishery additional opportunities for U.S. vessels to more fully harvest the domestic swordfish quota (72 FR 31688; June 7, 2007). Reasonable future actions may include: changes to time/area closures; modifications to EFH descriptions; modifications to swordfish quotas; modifying handling and release requirements for sea turtles in other HMS fisheries; authorization of green stick fishing

gear for Atlantic tunas including bluefin tuna; and, actions taken to reduce protected species interactions in HMS fisheries, particularly in the PLL fishery (*e.g.*, implementation of the Pelagic Longline Take Reduction Plan and/or reinitiating consultation under Section 7 of the Endangered Species Act). These are measures that, while not all directly related to sharks, could be implemented in other rulemakings and affect participants in shark fisheries in conjunction with the preferred alternative suite selected in this rulemaking.

In general, preferred alternative suite 4 would implement quotas and retention limits necessary to rebuild and stop overfishing of several shark species; it maximizes scientific data collection by implementing a limited research fishery for sandbar sharks to continue with 100 percent observer coverage; and mitigate some of the significant economic impacts that are necessary and expected under all the alternative suites to reduce fishing mortality as prescribed by recent stock assessments. While NMFS has evaluated the cumulative ecological and socioeconomic impacts of this preferred alternative suite below, NMFS also evaluated how other non-HMS fisheries may be impacted by the preferred alternative suite. In particular, NMFS evaluated other fisheries that vessels currently maintain permits for, shark fishermen's ability to enter other fisheries, and the subsequent impacts those fisheries might experience as a result of redirected shark fishing effort.

As part of this analysis, NMFS investigated the different types of commercial permits that directed and incidental shark permit holders currently have in addition to their HMS permits (see Table 3.42). NMFS found that many directed and incidental shark permit holders also have Gulf of Mexico reef fish, dolphin/wahoo, mackerel (including king and Spanish mackerel), and South Atlantic snapper/grouper commercial permits. A few fishermen also have lobster and non-HMS Charter/Headboat permits. NMFS also evaluated the ability of shark fishermen to move into these other fisheries (*i.e.*, Gulf of Mexico reef fish, dolphin/wahoo, mackerel, and South Atlantic snapper/grouper fisheries) as a result of quota and retention limit reductions in the Atlantic shark fishery under preferred alternative suite 4. Shark fishermen may also participate in shark fisheries in state waters or may participate in other HMS fisheries for which they may already possess permits. Table 3.42 includes vessels that possess swordfish permits in addition to commercial shark permits. An overview of each fishery is listed below, and the cumulative ecological and socioeconomic impacts of the preferred alternative, including impacts of any redistributed effort to other fisheries, are discussed below.

Gulf of Mexico Reef Fish Fishery

The Gulf of Mexico Fishery Management Council (Council) originally established the Gulf of Mexico Reef Fish FMP in 1984. Twenty seven amendments have been made to this plan and there are currently four additional amendments under development.

A Gulf of Mexico commercial reef fish vessel permit allows the harvest and sale of all reef fish listed in the Reef Fish FMP under quota (where applicable) and in excess of the bag limits (where applicable), except goliath grouper (all harvest prohibited), Nassau grouper (all harvest prohibited), and red snapper. Fishermen wanting to harvest and sell red snapper must also possess individual fishing quota (IFQ) shares. Issuance of new reef fish permits is under a moratorium. Access to this fishery is limited to existing permits holders. However, existing permits are transferable. In 2007, shark directed and incidental permit holders possessed 153

Gulf of Mexico reef fish permits, which represent 29% of all shark permit holders. These Gulf of Mexico reef fish permits held by shark permitted vessels are concentrated in Florida and represent 84% of the 153 GOM reef fish permits.

A portion of reef fish permit holders also possess IFQ shares, which allow them to land red snapper in addition to other reef fish. Anyone commercially fishing for red snapper now must possess an IFQ allocation and follow the established reporting protocol. Quota shares are freely transferable to any other reef fish permit holders during the first 5 years following implementation of the IFQ program and then to anyone thereafter. Shark permit holders that also possess a reef fish permit, but did not receive an IFQ allocation will likely find that it will be costly to attain such an allocation.

The Gulf of Mexico Reef Fish FMP authorizes the use of longline, hook and line, handline, bandit gear, rod and reel, buoy gear, spear, powerhead, cast net, and trawl. There is a 6,000 lbs gutted weight trip limit for all groupers, deep-water and shallow-water, combined. A 2007 interim rule for red snapper set the commercial quota at 3.315 million pounds (mp) and reduced the commercial size limit to 13 inches. In June 2007, the Council approved Joint Reef Fish Amendment 27/Shrimp Amendment 14. If implemented by NOAA Fisheries Service, this amendment would reduce the commercial quota to 2.55 mp between 2008 and 2010. The amendment would also reduce the commercial minimum size limit to 13 inches total length, require the use of non-stainless steel circle hooks, venting tools, and dehooking devices when fishing for reef fish, establish a red snapper bycatch mortality reduction goal for the shrimp trawl fishery, and establish, if necessary, shrimp fishery seasonal closures if the reduction target is not met.

The Gulf of Mexico Fishery Management Council is working on other actions including: Reef Fish Amendments 30A and 30B to address overfishing of gag, greater amberjack, and gray triggerfish; Reef Fish Amendment 29 to establish a grouper IFQ program; and a generic aquaculture amendment.

Approximately 30 percent of all shark permit holders already possess the limited access permits necessary to participate in the Gulf of Mexico reef fish fishery. Of these, the Agency did not estimate the number of vessels that were selected to participate in the red snapper fishery since the inception of an IFQ program for that fishery because permits to participate in this fishery are no longer being issued. Since the fishery is limited access and has extensive measures in place to control effort and harvest levels, it is not likely that shark fishermen will be able to compensate all potential losses from reductions in quota and retention limits proposed for sharks solely by transferring effort to the Gulf of Mexico reef fish fishery.

Dolphin/Wahoo Fishery

In the Gulf of Mexico, dolphin are included in the management unit under the Coastal Migratory Pelagic Resources FMP, and a charter/headboat vessel permit is required to fish for or possess dolphin in the Gulf of Mexico. Otherwise, there are no regulations controlling the harvest of these species in the Gulf of Mexico.

In the South Atlantic, historically, the dolphin/wahoo fishery has been a recreational fishery (NMFS, 2003). However, during the 1990s, commercial landings in the Atlantic Ocean increased, due in part to an increasing number of pelagic longliners targeting dolphin (NMFS, 2003). As a result, the South Atlantic Fishery Management Council, in cooperation with Mid-Atlantic and New England Fishery Management Councils, developed a comprehensive FMP for both dolphin and wahoo in the Atlantic Ocean (NMFS, 2003). This FMP was approved in December of 2003. The final rule implementing the regulations in this FMP was published on May 27, 2004 (69 FR 30235). Owing to the significant importance of the dolphin/wahoo fishery to the recreational fishing community in the Atlantic, the overall goal of the FMP was to adopt a precautionary and risk-averse approach to management that set harvest limits based on the status quo at that time, which was average catch and effort levels from 1993 to 1997 (NMFS, 2003). These limits were implemented to deter shifts in the historical PLL fisheries for sharks, tunas, and swordfish or expansions into nearshore coastal waters to target dolphin, which could create user conflicts and possible localized depletion in abundance (NMFS, 2003).

As such, the dolphin/wahoo fishery is an open access fishery where people can purchase a vessel, dealer, or operator permit in the South Atlantic. Operators of commercial vessels, charter vessels, and headboats in the South Atlantic that fish south of 39° North Latitude are required to have a Federal vessel permit for dolphin/wahoo and must have and display operator permits. There is no trip limit for dolphin for a vessel with a commercial Federal vessel permit. However, there is a 500 pound commercial trip limit for wahoo for vessels with such a permit. For commercially permitted vessels fishing north of 39° North Latitude that do not have a Federal commercial vessel permit for dolphin/wahoo, there is a trip limit of 200 pounds of dolphin and wahoo. In addition, there is a 20-inch fork length minimum size limit for dolphin off the coasts of Georgia and Florida with no size restrictions elsewhere, and PLL fishing for dolphin and wahoo is prohibited in areas closed to the use of such gear for HMS. Dolphin and wahoo longline vessels must also comply with sea turtle protection measures. Finally, there is also a non-binding 1.5 million pound (or 13 percent of the total harvest) cap on commercial landings for dolphin. Should the catch exceed this level, the South Atlantic Fishery Management Council would review the data and evaluate the need for additional regulations, which may be established through a framework action.

The recreational dolphin fishery has the same minimum size. In addition, there is a recreational bag limit of 2 wahoo per person per day and 10 dolphin per person per day or 60 dolphin per boat per day, whichever is less (headboats are excluded from the boat limit). There is a prohibition on recreational sale of dolphin and wahoo caught under the bag limit unless the seller holds the necessary commercial permits.

The authorized gears for dolphin and wahoo fishery are hook-and-line gear including manual, electric, and hydraulic rods and reels; bandit gear; handlines; longlines; and spearfishing (including powerheads) gear. Pelagic longline vessels permitted in the shark and swordfish fisheries are subject to the hook size regulations regarding the HMS fishery, which has impacted their ability to simultaneously fish for dolphin by attaching smaller-hooked gangions directly to their PLL gear. The total 1999 recreational harvest accounted for 91% (10,127,970 pounds total recreational harvest and 1,050,090 pounds commercial harvest) of the total U.S. harvest (NMFS, 2003).

The commercial fishery for wahoo appears to be incidental to fishing for dolphin or other pelagic species. Like dolphin, the recreational landings of wahoo account for a larger proportion of the total harvest in the Gulf of Mexico and Atlantic Ocean. In 1999, the total commercial harvest amounted to 99,159 pounds, compared to 1.41 million pounds harvested by recreational anglers (NMFS, 2003).

The dolphin/wahoo fishery is extremely seasonal in nature. This seasonality would influence the number of displaced shark fishermen's ability to direct effort towards dolphin and wahoo. In addition, there have been no formal stock assessments for dolphin or wahoo. The status of wahoo is considered unknown, and time-series data seems to indicate neither a decline in stock abundance nor a decrease in mean size of individual dolphin fish (SAFMC, 1998). However, a precautionary approach to management was taken in 2003 since the dolphin and wahoo tend to aggregate, they are economically valuable before the age of maturity, and there is high interannual variability in these stocks due to environmental factors. Therefore, the 2003 FMP set harvest limits based on the status quo at that time.

As of 2007, 256 dolphin/wahoo permit holders also have directed and incidental shark permits (Table 3.42). 156 of these dolphin/wahoo permit holders are from the state of Florida (Table 3.42). Since the dolphin/wahoo fishery is an open access fishery, shark permit holders who do not currently have a dolphin/wahoo permit would be able to enter the fishery in the South Atlantic. Fishermen in the Gulf of Mexico could switch to the dolphin/wahoo fishery without trip limits or any permit requirements. In addition, shark fishermen could modify their gear so that a greater proportion of their catch is dolphin and wahoo. These species are pelagic in nature; therefore, BLL gear would have to be placed near the surface of the water column, essentially converting it to PLL gear. Pelagic longline regulations include hook requirements of 18/0 (with an offset not to exceed 10°) or 16/0 non-offset circle hooks if they also possess HMS permits for swordfish and/or tunas. These larger hooks would make it difficult to catch small dolphin and wahoo, thus limiting catch to larger individuals. In addition, because of the seasonal nature of this fishery, directed fishing year-round would be difficult.

Spanish mackerel

In the South Atlantic, fisheries for Spanish mackerel (*Scomberomorus maculatus*) are important for commercial participants who also engage in shark fisheries. Fisheries are managed by the South Atlantic Fishery Management Council and the Gulf of Mexico Fishery Management Council under the FMP for Coastal Migratory Pelagic Resources and its amendments. A stock assessment for Spanish mackerel was completed in 2003/2004. The assessment was done on the Atlantic and Gulf of Mexico population and found that neither population were overfished or experiencing overfishing (SEFSC, 2007).

Authorized gear include for Spanish mackerel in the South Atlantic include automatic reel, bandit gear, rod and reel, cast net, run-around gill nets, and stab nets; in the Gulf of Mexico, all gears are legal except drift and long gillnets and purse seines. However, there is an incidental catch allowance for vessels with purse seines onboard. A minimum size of 3.5" (8.9 cm) stretched mesh is required for all run-around gill nets and soak time is limited to one hour. The fishing year in the South Atlantic is from March 1 through the end of February, The fishing year

in the Gulf of Mexico is April 1 through March 31. A federal vessel permit is required for commercial fisheries; however, the fishery is open to new participants who can demonstrate they meet an income requirement.

In the South Atlantic, the fishery is managed in two zones with differing regulations: a northern zone (Georgia to New York) and a southern zone (east coast of FL to Dade-Monroe County). Catch restrictions vary by month and are dependant on the percentage of each zones allocation that is actually harvested. The majority of landings occur off of Florida, where the commercial trip limit from April – November is 3,500 lb/trip. Trip limits are unlimited on weekdays beginning December 1 with a 1,500 lb trip limit on weekends until 75 percent of the quota is reached, and 1,500 lb daily trip limits are established. When 100 percent of the adjusted quota is met, trip limits are reduced to 500 pounds through the end of fishing year. (SAFMC, 2007a).

Gillnets were the predominant gear type for Spanish mackerel prior to the net ban in Florida. Currently, approximately 60 percent of the overall catch comes from cast nets and approximately 25 percent are caught with gillnets, the remainder being caught with other authorized gears. In Florida, the majority of the effort is still in state waters, where gillnets are not allowed. Some netting occurs in Federal waters, however, the cast net is used more often. Fishing effort follows the fish migrating north to waters off North Carolina in the summer and then following the fish back to Florida during the winter months. Sinknets are the primary gear type off North Carolina.

Shark fishermen could transfer fishing effort to Spanish mackerel fisheries to replace some of the lost revenues as a result of measures proposed in this rulemaking. Many vessels that deploy gillnets for sharks also possess Spanish mackerel permits. Of vessels that possess directed shark permits, 107 also possess Spanish mackerel permits. There are currently 121 Spanish mackerel permits possessed by shark incidental permit holders (Table 3.42). Because the commercial fishery for Spanish mackerel is not limited access, with only an income qualifier restriction, and the stocks are healthy, this could be an attractive fishery for participants to engage in, especially those who possess vessels that are already set up for fishing with gillnet or castnet gear.

NMFS recently published a final rule (June 25, 2007, 72 FR 34632) revising regulations implementing the Atlantic Large Whale Take Reduction Plan (ALWTRP) by expanding the Southeast U.S. Restricted Area and modifying regulations pertaining to gillnetting within the Southeast U.S. Restricted Area. NMFS is prohibiting gillnet fishing or gillnet possession during annual restricted periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. An exemption to the possession prohibition is provided for transiting through the area if gear is stowed in accordance with this final rule. This action is required to meet the goals of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). This action is necessary to protect northern right whales from serious injury or mortality from entanglement in gillnet gear in their calving area in Atlantic Ocean waters off the Southeast U.S.

King Mackerel

Commercial fisheries for king mackerel (*Scomberomorus cavalla*) are also an important source of revenue for participants in the Atlantic and Gulf of Mexico regions. A stock assessment was conducted for king mackerel in 2005. The assessment determined that the Atlantic and Gulf of Mexico migratory groups of king mackerel are not overfished or experiencing overfishing. Permits in the commercial fishery are limited access and there is currently a permit moratorium in place. The minimum size for king mackerel is 24" (61 cm); however, vessels may possess up to five percent of the fish on board as undersized fish. In the South Atlantic, the fishing season is March 1 through the end of February, or until the quota is met. In the Gulf of Mexico, the fishing year is July 1 through June 30.

In the South Atlantic, trip limits vary by region and time of year, including:

- From New York to Flager/Volusia County, Florida from April 1 to March 31, the trip limit is 3,500 pounds;
- From Flager/Volusia to Volusia/Brevard County lines from April to October 31, the trip limit is 75 fish; and,
- In Monroe County, Florida, from April 1 to October 31, the trip limit is 1,250 pounds.

Authorized gear for king mackerel varies by region, including: rod and reel, bandit gear, handline, automatic reel, gillnets and long gillnets (except north of Cape Lookout, NC); PLL, run-around gillnets (>4.75" (12.1 cm) stretched mesh); and purse seine (no more than 400,000 lbs may be harvested by purse seine) (SAFMC, 2007c).

In the Gulf of Mexico, trip limits are established according to regional sub-divisions, each with their own quota.

- From the Florida/Alabama state boundary through Texas, the trip limit is 3,000 pounds.
- From The Florida/Alabama state boundary to the Lee/Collier County, Florida, boundary, the trip limit is 1,250 pounds.
- From the Lee/Collier County boundary to the Monroe/Miami-Dade County boundaries, from November 1 through March 31, the trip limit is 1,250 pounds.
- From the Monroe/Miami-Dade County boundary to the Broward/Volusia County boundary, from November 1 through March 31, the trip limit is 50 fish until February 1, when it increases to 75 fish if 75% of the quota is not taken.

There are 87 king mackerel permits maintained by shark directed permit holders. Incidental shark permit holders possess 117 permits (Table 3.32). The king mackerel fishery is limited access so entry by those who do not currently possess a permit would be more difficult. Because 204 shark fishermen also have king mackerel permits, it is anticipated that shark fishermen may increase fishing effort in king mackerel fisheries. Vessels that are already set up to deploy run-around gillnets, PLL, bandit gear, or other gillnets are most likely to increase fishing effort in the king mackerel fishery as they would have the least difficulty reconfiguring their vessel.

South Atlantic Snapper/Grouper Fishery

The South Atlantic Fishery Management Council (SAFMC) manages the 73 species that comprise the South Atlantic snapper/grouper fishery management unit (FMU). In 1998, Amendment 8 to the snapper/grouper FMP was implemented initiating a limited access program. Recent stock assessments were conducted for two deepwater snapper/grouper species, snowy grouper and golden tilefish as well as some shallower snapper/grouper species (red porgy, vermilion snapper, and black sea bass). Snowy grouper, black sea bass, and red porgy were found to be overfished. Red porgy and golden tilefish were determined to not be overfished, and the overfished status of vermilion snapper was unknown. Snowy grouper, golden tilefish, black sea bass, and vermilion snapper were determined to be experiencing overfishing.

NMFS implemented the final rule for Amendment 13C to the FMP for the South Atlantic snapper/grouper Fishery on October 23, 2006 (71 FR 55096). The intent of the amendment was to reduce harvests, end overfishing, and achieve optimum yield. The management measures included in the final rule were reductions in annual commercial quotas for snowy grouper and golden tilefish. Quotas were specified for black sea bass, red porgy, and vermilion snapper, and commercial trip limits were increased for red porgy. Amendment 14 was recently approved for submission to NMFS by the SAFMC during their June 2007 meeting and would establish eight MPAs off South Atlantic states to protect a portion of the population and habitat of deepwater snapper/grouper species from directed fishing pressure. Amendment 14 includes a measure to prohibit use of shark BLL gear in the MPAs. If Amendment 14 is approved by NMFS, harvest would be prohibited for all species in the snapper/grouper complex in these eight MPAs. The proposed rule for Amendment 14 should be available for public comment during the fall of 2007. In this rulemaking, MPAs proposed by the SAFMC are analyzed and included in several of the alternative suites, including the preferred alternative suite.

At its December 2006 Council meeting the SAFMC voted to explore an Individual Fishing Quota (IFQ) program as a possible management tool for the snapper/grouper fishery. An IFQ for the snapper/grouper fishery would eliminate restrictive trip limitations, eliminate discards by requiring 100 percent retention of catch, and fishermen would be required to cover their catch with their quota. The SAMFC is still exploring how the allocation would work, who would be eligible to participate, how the program would be enforced, and who would pay the cost recovery fee. The SAFMC has formed a Limited Access Privilege Program (LAPP) Exploratory Workgroup to discuss these issues in public meetings. The public meetings will be held throughout the summer and fall of 2007. The 114 shark directed and incidental permit holders that already possess limited access permits in the snapper/grouper fishery may benefit from this future IFQ program as it may mitigate the more restrictive management measures that are in place for some of the snapper/grouper species. However, entrance into the snapper/grouper fishery would be difficult due to the need to find two transferable limited access permits available for purchase, the restrictive management measures that are currently in place to reduce harvests and end overfishing and because of the possibility of the change in management structure to an IFQ program.

Currently, 114 shark directed and incidental permit holders also hold permits in the South Atlantic snapper/grouper fishery. Of the 114 permits, 102 of those permit holders possess the transferable snapper/grouper permit with an unlimited trip limit and 12 hold the non-transferable

snapper/grouper permit with a 225 lb trip limit. New entrants into the snapper/grouper fishery must obtain two existing snapper/grouper transferable permits and exchange them for one new permit. Allowable commercial gear for the snapper/grouper fishery includes vertical hook and line including bandit gear, black sea bass pots, sink nets (North Carolina only), and BLL. Vessels with BLL gear onboard may only possess snowy grouper, one warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish. No other snapper/grouper species may be possessed or harvested.

4.16 Cumulative Ecological Impacts

The preferred alternative suite 4, which would establish a small research fishery that could harvest the full sandbar quota as well as other shark species and allow vessels outside the research fishery to retain non-sandbar LCS, SCS, and pelagic sharks, would provide positive ecological impacts by allowing overfished sandbar, dusky, and porbeagle sharks to rebuild and stop overfishing of sandbar and dusky sharks. By allowing a limited number of historical participants to continue to harvest sharks in a manner resembling how the fishery was traditionally executed in addition to meeting other research objectives, the Agency would ensure that data for stock assessments and life history samples would continue to be collected, which would help with future management of these stocks. However, the number of trips these participants could make would be limited by the sandbar quota, thus limiting fishing effort and sandbar mortality and allowing this stock to rebuild. Individuals not selected to participate in the shark research program could still land 22 non-sandbar LCS/vessel/trip, which would limit the number of trips targeting non-sandbar LCS sharks, and prevent overfishing of these species. However, this retention limit would still afford the opportunity to keep some sharks that are landed incidentally, preventing excessive discards of these species. In addition, alternative suite 4 would require that sharks be landed with their fins still attached; this requirement could prevent fishermen from keeping the fins from sharks that are not landed, resulting in a reduction of overall shark mortality.

Since only a few vessels would likely be participating in the research fishery, interactions with protected resources may decrease as a result of less BLL and gillnet fishing effort targeting sharks. It is assumed that some of this fishing effort may be displaced to other gillnet and BLL fisheries in which participants are permitted, which may interact with protected resources. However, other fisheries such as the South Atlantic snapper/grouper and Gulf of Mexico reef fish fisheries are limited access fisheries. If fishermen do not currently hold permits in these fisheries, it would be difficult and expensive for them to enter these fisheries in the future. In addition, for shark fishermen that are currently permitted in these fisheries, strict retention limits and quotas are either in place or about to be implemented, which would protect these stocks from further overfishing and being further overfished by any redirected shark fishing effort. Therefore, redistributed effort is not anticipated to result in a significant increase in bycatch or interactions with protected resources.

Other fisheries that are still open access that shark fishermen could pursue, such as the mackerel fishery and the dolphin/wahoo fishery, generally have few interactions with protected resources and little bycatch compared to directed shark fishing trips (see NMFS, 2003 and Carlson and Bethea, 2007). Therefore, redistributed effort into these fisheries is not anticipated to increase interactions with protected resources or result in significant increases in bycatch. In

addition, retention limits, quotas and other effort controls are in place for these fisheries to protect the stocks from overfishing and from being overfished.

In addition to these impacts, cumulative ecological impacts on HMS stocks and fisheries due to actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies may be slightly positive. NMFS has recently backstopped the Caribbean Fishery Management Council's area closures that could have minor positive benefits for Atlantic HMS (72 FR 5633, February 7, 2007). NMFS also recently published a rule that requires sea turtle handling and release equipment in the shark BLL fishery (72 FR 5633, February 7, 2007). The South Atlantic Fishery Management Council is considering management measures including time/area closures for BLL gear to protect grouper species that may have some impacts on HMS fishermen, particularly the shark fishermen. Under this rule, charter/headboat fishermen would also need to comply with the protected resources dehooking requirements. The Gulf of Mexico Fishery Management Council recently proposed regulations that would implement similar dehooking requirements to those required in the HMS PLL fishery and to those proposed for the HMS BLL fishery (71 FR 45428, August 9, 2006). NMFS has also recently implemented workshops for the safe handling and release and identification of protected resources for all HMS gillnet and longline fishery participants, and identification workshops for shark dealers (71 FR 58058, October 2, 2006). In addition, the Atlantic States Marine Fisheries Commission is developing an interstate shark fishery management plan, which would likely have positive ecological impacts because many shark nursery areas are located in state waters.

4.17 Cumulative Social and Economic Impacts

The preferred alternative 4 would allow a small pool of vessels to continue to collect reduced revenues from sharks. Significant negative economic impacts would still likely occur under alternative suite 4. For instance, shark fishermen outside the research fishery would not be able to land sandbar sharks and would have their non-sandbar LCS retention limit reduced, resulting in 48 percent reduction in gross revenues compared to the status quo (Table 4.16). These losses in gross revenues may be exacerbated by the requirement to land shark with their fins attached. In addition, eliminating regions and seasons represents an economic disadvantage to the North Atlantic region as sharks are not present in these waters year-round, meaning the quota may be filled in some years before sharks are present in these areas. The elimination of seasons and regions combined with limiting underharvest carry-overs may have negative economic impacts on fishermen, especially for regions that consistently had underharvests of species like SCS. However, incidental permit holders would have higher retention limits of sandbar and non-sandbar LCS inside the research fishery as well as the potential to land higher retention limits of non-sandbar LCS outside the research fishery. Therefore, they might experience positive economic benefits under alternative suite 4. Since most incidental permit holders are in the states of Florida, Louisiana, and New Jersey, these states are anticipated to experience the largest socioeconomic benefits under alternative suite 4.

It is unlikely that shark fishermen would be able to recuperate all of the economic losses that are likely with the proposed measures for the shark fishery by switching to other southeast fisheries due to quota reductions and/or limited access programs in these other fisheries. The Agency presumes that since some shark fishermen also possess several permits in other fisheries,

they do not receive all of their revenues from shark-products. At the present time, it is estimated that fishermen make decisions about which fisheries to participate in based on the ex-vessel prices they can expect from a given species of fish, seasonality, quotas, trip limits, and other factors. In the past, revenues received from sharks likely comprised a larger share of their overall revenues from fishing activities than is expected in the future. However, it could be difficult for all lost shark revenues to be replaced by transferring more effort to other fisheries in which they have historically participated.

For instance, there are limited-access permit programs in place for the South Atlantic snapper/grouper fishery as well as the Gulf of Mexico reef fish fishery, where no new permits are being issued. Therefore, if shark fishermen do not currently possess a South Atlantic snapper/grouper permit or a Gulf of Mexico reef fish permit, it would be difficult and costly to enter these fisheries in the future. There are also quota reductions proposed for many reef fish species (see above), which would affect current Gulf of Mexico reef fish permit holders. Shark fishermen who have shark and reef fish permits could be experiencing economic hardships in both fisheries.

In addition, there is an IFQ program in place for the Gulf of Mexico red snapper fishery, with limitations on transfers during the first 5 years (see above), and a new IFQ program will be implemented in the near future for the South Atlantic snapper/grouper fishery. These IFQ programs could benefit current South Atlantic snapper/grouper or Gulf of Mexico red snapper permit holders; however, it would make it difficult and expensive for shark fishermen who do not currently possess these permits to enter these fisheries in the future.

As mentioned above, the dolphin/wahoo fishery is an open access fishery, especially in the Gulf of Mexico. However, redistribution of commercial shark fishing effort into this fishery may result in user conflicts between recreational and commercial fishermen. Additionally, commercial PLL fishermen that currently fish for dolphin and wahoo could suffer economically if a large proportion of the shark fishermen redirect to the dolphin/wahoo fishery, given the 1.5 million pounds commercial landings cap (or 13 percent of total landings, whichever is greater) for the dolphin fishery. If this cap is exceeded, the SAFMC may decide to take more stringent measures in this fishery to reduce overall catch. More importantly, due to the seasonality of the dolphin/wahoo fishery, it would be difficult for commercial fishermen to direct on dolphin/wahoo (S. Branstetter, personal communication). Finally, it would be difficult for shark fishermen using PLL gear to catch smaller dolphin and wahoo due to hook requirements in the PLL fishery (see discussion above). Shark fishermen would have to either target larger fish with larger circle hooks or relinquish their HMS permit(s) so that they could use smaller hook sizes to target smaller dolphin/wahoo. The latter would preclude them from retaining any HMS catch.

It is likely that shark fishermen using gillnet gear for sharks would transfer some fishing effort to the Spanish mackerel fishery. Participants currently using other gears for sharks may consider purchasing the necessary gear (*e.g.*, gillnets, etc.) to become involved in this fishery. Since this fishery is not limited access, transferring effort into this fishery would not require paying exorbitant costs to acquire permits from other vessels. Furthermore, since the stock status of Spanish mackerel is healthy, there does not appear to be any significant restrictions on quotas or other effort controls necessary at this time or in the foreseeable future. However, this fishery

is seasonal, so year-round revenues from Spanish mackerel may not be realized. Rather, participants in North Carolina would be expected to fish for Spanish mackerel in the summer while participants in Florida could target these fish in the winter.

The commercial fishery for King mackerel is managed via a limited access permit system, and shark fishermen who do not currently possess a King mackerel permit may have a difficult time entering this fishery. However, there are 204 participants in the shark fishery that currently possess these king mackerel permits. Therefore, effort in this fishery is expected to increase as a result of shark management measures proposed in this rulemaking.

References

- Barnette, M.C. 2001. A review of the fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Technical Memorandum NMFSSEFSC-449.
- Caribbean Fishery Management Council (CFMC). 2004. Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to: Spiny Lobster Fishery Management Plan, Queen Conch Fishery Management Plan, Reef Fish Fishery Management Plan, Coral Fishery Management Plan for the U.S. Caribbean. 497 pp.
- Carlson, J.K. and D. M. Bethea. 2007. Catch and bycatch in the shark gillnet fishery: 2005-2006. NOAA Technical Memorandum NMFS-SEFSC-552, 26 p.
- Cortés, E. and J. Neer. 2005. Updated Catches of Atlantic Sharks. LCS05/06-DW-16, 58 pp.
- Gulf of Mexico Fishery Management Council (GOMFMC). 2004. Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the following fishery management plans of the Gulf of Mexico (GOM): Shrimp Fishery of the Gulf of Mexico, Red Drum Fishery of the Gulf of Mexico, Reef Fish Fishery of the Gulf of Mexico, Stone Crab Fishery of the Gulf of Mexico, Coral and Coral Reef Fishery of the Gulf of Mexico, Spiny Lobster Fishery of the Gulf of Mexico and South Atlantic, Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic. 682 pp.
- Hale, L.F. and J. K. Carlson. 2007. Characterization of the shark bottom longline fishery: 2005-2006. NOAA Technical Memorandum NMFS-SEFSC 554, 28 p.
- Morgan, L.E., and R. Chuenpagdee. 2003. Shifting gears: addressing the collateral impacts of fishing methods in U.S. waters. Island Press, Washington, D.C. 52 pp.
- NMFS, 2003. Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic. South Atlantic Fishery Management Council in Cooperation with the New England Fishery Management Council, Mid-Atlantic Fishery Management Council. Charleston, SC, Public Document. 386 pp
- NMFS. 2006. Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Highly Migratory Species Management Division, 1315 East West Highway, Silver Spring, MD. Public Document. pp. 1600.

- Northeast Region Essential Fish Habitat Steering Committee (NREFHSC). 2002. Workshop on the effects of fishing gear on marine habitats off the northeastern United States, October 23-25, 2001. Northeast Fisheries Science Center Reference Document 02-01. 86 p. National Marine Fisheries Service, NOAA, 166 Water Street, Woods Hole, MA 02543-1026.
- Siegfried, K., M. Ribera, L. Hale, and J. Carlson. 2006a. Expanded take estimates of snapper-grouper from the shark bottom longline fishery within proposed Type II Marine Protected Areas in the South Atlantic Fishery Management Council's Amendment 14 to the Snapper-Grouper Fishery Management Plan. National Marine Fisheries Service Southeast Fisheries Science Center Panama City Laboratory 3500 Delwood Beach Road Panama City, FL 32408. 11p.
- Siegfried, K., M. Ribera, L. Hale, and J. Carlson. 2006b. Expanded take estimates of coastal shark from the shark bottom longline fishery within proposed Type II Marine Protected Areas in the South Atlantic Fishery Management Council's Amendment 14 to the Snapper-Grouper Fishery Management Plan. National Marine Fisheries Service Southeast Fisheries Science Center Panama City Laboratory 3500 Delwood Beach Road Panama City, FL 32408. 9p.
- South Atlantic Fishery Management Council (SAFMC). 1998. Dolphin/Wahoo Workshop Report. Prepared by the South Atlantic Fishery Management Council, May 1998. Available from: SAFMC, 1 Southpark Circle, Suite 306, Charleston, South Carolina 29407-4699.
- SAFMC. 2007a. South Atlantic Fishery Management Council, Regulations by Species – Spanish Mackerel. June 18, 2007.
<http://www.safmc.net/FishIDandRegs/FishGallery/SpanishMackerel/tabid/329/Default.aspx>.
- SAFMC. 2007b. Amendment 18 to the Coastal Migratory Pelagics Fishery Management Plan to Revise the South Atlantic Migratory Group King and Spanish Mackerel TACs and Spanish Mackerel Trip Limits. Public Hearing Draft. June 18, 2007.
<http://www.safmc.net/Portals/6/Meetings/Council/BriefingBook/March%202007/Attach%201.%20Draft%20Mackerel%20Am18%20BBook%202-26-07.pdf>
- SAFMC. 2007c. South Atlantic Fishery Management Council, Regulations by Species – King Mackerel. June 18, 2007.
<http://www.safmc.net/FishIDandRegs/FishGallery/KingMackerel/tabid/297/Default.aspx>
- SEFSC. 2007. Southeast Fisheries Science Center – SEDAR homepage. June 19, 2007.
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=05